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THE AMERICAN NAUTICAL ALMANAC

FOR THE YEAR

1954

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PACIFIC OCEANIC FISHERY
INVESTIGATIONS

AUG 14 1953

UNITED STATES NAVAL OBSERVATORY

WASHINGTON

D.C.

STARS

NAME	MAG.	NO.
Acamar	3.1	7
Achernar	0.6	5
Acrux	1.1	30
Adhara	1.6	19
Aldebaran	1.1	10
Alioth	1.7	32
Alkaid	1.9	34
Al Na'ir	2.2	55
Alnilam	1.8	15
Alphard	2.2	25
Alphecca	2.3	41
Alpheratz	2.2	1
Altair	0.9	51
Ankaa	2.4	2
Antares	1.2	42
Arcturus	0.2	37
Atria	1.9	43
Avior	1.7	22
Bellatrix	1.7	13
Betelgeuse	0.1 to 1.2	16
Canopus	−0.9	17
Capella	0.2	12
Deneb	1.3	53
Denebola	2.2	28
Diphda	2.2	4
Dubhe	2.0	27
Elnath	1.8	14
Eltanin	2.4	47
Enif	2.5	54
Fomalhaut	1.3	56
Gacrux	1.6	31
Gienah	2.8	29
Hadar	0.9	35
Hamal	2.2	6
Kaus Australis	2.0	48
Kochab	2.2	40
Markab	2.6	57
Menkar	2.8	8
Menkent	2.3	36
Miaplacidus	1.8	24
Mirfak	1.9	9
Nunki	2.1	50
Peacock	2.1	52
Pollux	1.2	21
Procyon	0.5	20
Rasalhague	2.1	46
Regulus	1.3	26
Rigel	0.3	11
Rigil Kentaurus	0.1	38
Sabik	2.6	44
Schedar	2.5	3
Shaula	1.7	45
Sirius	−1.6	18
Spica	1.2	33
Suhail	2.2	23
Vega	0.1	49
Zubenelgenubi	2.9	39

CORRECTIONS TO OBSERVED ALTITUDES

STARS AND PLANETS

Obs. Alt. ° ′	corr'n ′	Obs. Alt. ° ′	corr'n ′
4 23	−10.9	9 44	−5.4
4 26	−10.8	9 56	−5.3
4 29	−10.7	10 08	−5.2
4 32	−10.6	10 20	−5.1
4 36	−10.5	10 33	−5.0
4 39	−10.4	10 46	−4.9
4 42	−10.3	11 00	−4.8
4 46	−10.2	11 14	−4.7
4 49	−10.1	11 29	−4.6
4 53	−10.0	11 45	−4.5
4 56	− 9.9	12 01	−4.4
5 00	− 9.8	12 18	−4.3
5 04	− 9.7	12 35	−4.2
5 08	− 9.6	12 54	−4.1
5 12	− 9.5	13 13	−4.0
5 16	− 9.4	13 33	−3.9
5 20	− 9.3	13 54	−3.8
5 24	− 9.2	14 16	−3.7
5 28	− 9.1	14 40	−3.6
5 32	− 9.0	15 04	−3.5
5 37	− 8.9	15 30	−3.4
5 41	− 8.8	15 57	−3.3
5 46	− 8.7	16 26	−3.2
5 51	− 8.6	16 56	−3.1
5 55	− 8.5	17 28	−3.0
6 00	− 8.4	18 02	−2.9
6 05	− 8.3	18 38	−2.8
6 11	− 8.2	19 17	−2.7
6 16	− 8.1	19 58	−2.6
6 21	− 8.0	20 42	−2.5
6 27	− 7.9	21 28	−2.4
6 32	− 7.8	22 19	−2.3
6 38	− 7.7	23 13	−2.2
6 44	− 7.6	24 11	−2.1
6 50	− 7.5	25 14	−2.0
6 56	− 7.4	26 22	−1.9
7 03	− 7.3	27 36	−1.8
7 09	− 7.2	28 56	−1.7
7 16	− 7.1	30 24	−1.6
7 23	− 7.0	32 00	−1.5
7 30	− 6.9	33 45	−1.4
7 37	− 6.8	35 40	−1.3
7 44	− 6.7	37 48	−1.2
7 52	− 6.6	40 08	−1.1
8 00	− 6.5	42 44	−1.0
8 08	− 6.4	45 36	−0.9
8 16	− 6.3	48 47	−0.8
8 25	− 6.2	52 18	−0.7
8 34	− 6.1	56 11	−0.6
8 43	− 6.0	60 28	−0.5
8 52	− 5.9	65 08	−0.4
9 02	− 5.8	70 11	−0.3
9 12	− 5.7	75 34	−0.2
9 23	− 5.6	81 13	−0.1
9 33	− 5.5	87 03	0.0
9 44		90 00	

SUN'S LOWER LIMB

Obs. Alt. ° ′	corr'n ′	Obs. Alt. ° ′	corr'n ′
4 22	+ 4.9	9 39	+10.4
4 25	+ 5.0	9 51	+10.5
4 28	+ 5.1	10 03	+10.6
4 31	+ 5.2	10 15	+10.7
4 34	+ 5.3	10 27	+10.8
4 37	+ 5.4	10 40	+10.9
4 41	+ 5.5	10 54	+11.0
4 44	+ 5.6	11 08	+11.1
4 48	+ 5.7	11 23	+11.2
4 51	+ 5.8	11 38	+11.3
4 55	+ 5.9	11 54	+11.4
4 58	+ 6.0	12 10	+11.5
5 02	+ 6.1	12 28	+11.6
5 06	+ 6.2	12 46	+11.7
5 10	+ 6.3	13 05	+11.8
5 14	+ 6.4	13 24	+11.9
5 18	+ 6.5	13 45	+12.0
5 22	+ 6.6	14 07	+12.1
5 26	+ 6.7	14 30	+12.2
5 31	+ 6.8	14 54	+12.3
5 35	+ 6.9	15 19	+12.4
5 39	+ 7.0	15 46	+12.5
5 44	+ 7.1	16 14	+12.6
5 49	+ 7.2	16 44	+12.7
5 53	+ 7.3	17 15	+12.8
5 58	+ 7.4	17 48	+12.9
6 03	+ 7.5	18 24	+13.0
6 08	+ 7.6	19 01	+13.1
6 13	+ 7.7	19 42	+13.2
6 19	+ 7.8	20 25	+13.3
6 24	+ 7.9	21 11	+13.4
6 30	+ 8.0	22 00	+13.5
6 35	+ 8.1	22 54	+13.6
6 41	+ 8.2	23 51	+13.7
6 47	+ 8.3	24 53	+13.8
6 53	+ 8.4	26 00	+13.9
7 00	+ 8.5	27 13	+14.0
7 06	+ 8.6	28 33	+14.1
7 13	+ 8.7	30 00	+14.2
7 19	+ 8.8	31 35	+14.3
7 26	+ 8.9	33 20	+14.4
7 34	+ 9.0	35 17	+14.5
7 41	+ 9.1	37 26	+14.6
7 49	+ 9.2	39 50	+14.7
7 56	+ 9.3	42 31	+14.8
8 04	+ 9.4	45 31	+14.9
8 13	+ 9.5	48 55	+15.0
8 21	+ 9.6	52 44	+15.1
8 30	+ 9.7	57 02	+15.2
8 39	+ 9.8	61 51	+15.3
8 48	+ 9.9	67 17	+15.4
8 58	+10.0	73 16	+15.5
9 08	+10.1	79 43	+15.6
9 18	+10.2	86 32	+15.7
9 28	+10.3	90 00	
9 39			

HEIGHT OF EYE

Feet	corr'n ′	Feet	corr'n ′
1.0	−1.0	46	− 6.5
1.2	−1.1	47	− 6.6
1.4	−1.2	49	− 6.7
1.7	−1.3	50	− 6.8
2.0	−1.4	52	− 6.9
2.3	−1.5	53	− 7.0
2.6	−1.6	55	− 7.1
3.0	−1.7	56	− 7.2
3.4	−1.8	58	− 7.3
3.8	−1.9	60	− 7.4
4.2	−2.0	61	− 7.5
4.6	−2.1	63	− 7.6
5.1	−2.2	65	− 7.7
5.5	−2.3	66	− 7.8
6.1	−2.4	68	− 7.9
6.6	−2.5	70	− 8.0
7.2	−2.6	72	− 8.1
7.8	−2.7	74	− 8.2
8.4	−2.8	75	− 8.3
9.0	−2.9	77	− 8.4
9.6	−3.0	79	− 8.5
10.3	−3.1	81	− 8.6
11.0	−3.2	83	− 8.7
11.7	−3.3	85	− 8.8
12.4	−3.4	87	− 8.9
13.2	−3.5	89	− 9.0
14.0	−3.6	91	− 9.1
14.8	−3.7	93	− 9.2
15.6	−3.8	95	− 9.3
16.4	−3.9	97	− 9.4
17.3	−4.0	99	− 9.5
18.2	−4.1	101	− 9.6
19.1	−4.2	103	− 9.7
20.0	−4.3	105	− 9.8
21	−4.4	107	− 9.9
22	−4.5	110	−10.0
23	−4.6	112	−10.1
24	−4.7	114	−10.2
25	−4.8	116	−10.3
26	−4.9	119	−10.4
27	−5.0	121	−10.5
28	−5.1	123	−10.6
29	−5.2	126	−10.7
30	−5.3	128	−10.8
31	−5.4	130	−10.9
33	−5.5	133	−11.0
34	−5.6	135	−11.1
35	−5.7	138	−11.2
36	−5.8	140	−11.3
38	−5.9	143	−11.4
39	−6.0	145	−11.5
40	−6.1	148	−11.6
42	−6.2	150	−11.7
43	−6.3	153	−11.8
44	−6.4	156	−11.9
46		158	

When an observed altitude, or the height of eye, corresponds exactly to a printed value, use the upper of the two possible corrections. For Venus, Mars, and the Sun's lower limb, apply also the additional corrections on the daily pages. For the Moon, see back cover. For the Sun's upper limb, and bubble sextant observations, see page 250.

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THE AMERICAN NAUTICAL ALMANAC

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FOR THE YEAR 1954

ISSUED BY THE NAUTICAL ALMANAC OFFICE
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April 1952.

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PREFACE

This volume of the *American Nautical Almanac* was prepared under the immediate supervision of G. M. Clemence and Glen H. Draper. The nature and arrangement of the material are the same as in the volume for 1953.

The object of the volume is to provide in convenient form the astronomical data required by mariners; that is, the Greenwich hour angle and declination of the celestial bodies used in navigation. These can always be found with two openings of the book, one (in the white section) for the hour and the other (in the yellow section) for the minute of observation. Each result is obtained as the sum of two or of three quantities, without interpolation.

The altitude corrections are obtained without interpolation; and the parallax and semidiameter of the Moon are not needed.

An explanation of the use of the *Almanac* is given near the end of the white section. This is followed by a supplementary list of 172 stars and tables for finding the latitude by Polaris.

F. A. Graf,
Captain, U. S. Navy,
Superintendent Naval Observatory.

Washington, *April 1952.*

GMT	♈ GHA	VENUS −3.4 GHA	Dec.	MARS 1.5 GHA	Dec.	JUPITER −2.3 GHA	Dec.	SATURN 0.8 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
1 0	100 06.6	186 43.7	−23 35.9	245 08.3	−12 43.8	22 00.8	+22 31.5	244 12.1	−11 46.8	232 28.4	110	−22 37.5	− 70
1	115 09.1	201 42.7	35.9	260 09.3	44.3	37 03.5	31.5	259 14.4	46.9	246 58.4	109	22 44.5	− 68
2	130 11.5	216 41.8	35.9	275 10.3	44.8	52 06.3	31.5	274 16.7	46.9	261 28.3	108	22 51.3	− 68
3	145 14.0	231 40.8	·· 36.0	290 11.3	·· 45.3	67 09.1	·· 31.5	289 18.9	·· 47.0	275 58.1	108	·22 58.1	− 66
4	160 16.5	246 39.8	36.0	305 12.4	45.8	82 11.9	31.5	304 21.2	47.1	290 27.9	107	23 04.7	− 66
5	175 18.9	261 38.9	36.0	320 13.4	46.3	97 14.7	31.4	319 23.5	47.1	304 57.6	106	23 11.3	− 64
6	190 21.4	276 37.9	−23 36.0	335 14.4	−12 46.8	112 17.5	+22 31.4	334 25.8	−11 47.2	319 27.2	105	−23 17.7	− 63
7	205 23.9	291 36.9	36.0	350 15.4	47.3	127 20.2	31.4	349 28.1	47.2	333 56.7	104	23 24.0	− 63
8	220 26.3	306 36.0	36.1	5 16.4	47.8	142 23.0	31.4	4 30.3	47.3	348 26.1	103	23 30.3	− 61
9	235 28.8	321 35.0	·· 36.1	20 17.5	·· 48.3	157 25.8	·· 31.4	19 32.6	·· 47.3	2 55.4	103	·23 36.4	− 59
10	250 31.3	336 34.0	36.1	35 18.5	48.8	172 28.6	31.4	34 34.9	47.4	17 24.7	102	23 42.3	− 59
11	265 33.7	351 33.0	36.1	50 19.5	49.3	187 31.4	31.3	49 37.2	47.4	31 53.9	101	23 48.2	− 58
12	280 36.2	6 32.1	−23 36.1	65 20.5	−12 49.8	202 34.2	+22 31.3	64 39.5	−11 47.5	46 23.0	100	−23 54.0	− 56
13	295 38.7	21 31.1	36.1	80 21.5	50.2	217 36.9	31.3	79 41.7	47.5	60 52.0	100	23 59.6	− 56
14	310 41.1	36 30.1	36.1	95 22.6	50.7	232 39.7	31.3	94 44.0	47.6	75 21.0	98	24 05.2	− 54
15	325 43.6	51 29.2	·· 36.1	110 23.6	·· 51.2	247 42.5	·· 31.3	109 46.3	·· 47.6	89 49.8	98	·24 10.6	− 53
16	340 46.0	66 28.2	36.2	125 24.6	51.7	262 45.3	31.3	124 48.6	47.7	104 18.6	97	24 15.9	− 52
17	355 48.5	81 27.2	36.2	140 25.6	52.2	277 48.1	31.2	139 50.9	47.7	118 47.3	96	24 21.1	− 50
18	10 51.0	96 26.3	−23 36.2	155 26.6	−12 52.7	292 50.9	+22 31.2	154 53.1	−11 47.8	133 15.9	96	−24 26.1	− 50
19	25 53.4	111 25.3	36.2	170 27.7	53.2	307 53.6	31.2	169 55.4	47.8	147 44.5	94	24 31.1	− 48
20	40 55.9	126 24.3	36.2	185 28.7	53.7	322 56.4	31.2	184 57.7	47.9	162 12.9	94	24 35.9	− 47
21	55 58.4	141 23.3	·· 36.2	200 29.7	·· 54.2	337 59.2	·· 31.2	200 00.0	·· 47.9	176 41.3	93	·24 40.6	− 46
22	71 00.8	156 22.4	36.2	215 30.7	54.7	353 02.0	31.2	215 02.3	48.0	191 09.6	93	24 45.2	− 44
23	86 03.3	171 21.4	36.2	230 31.7	55.2	8 04.8	31.1	230 04.5	48.1	205 37.9	91	24 49.6	− 43
2 0	101 05.8	186 20.4	−23 36.2	245 32.8	−12 55.7	23 07.5	+22 31.1	245 06.8	−11 48.1	220 06.0	91	−24 53.9	− 42
1	116 08.2	201 19.5	36.1	260 33.8	56.2	38 10.3	31.1	260 09.1	48.2	234 34.1	90	24 58.1	− 41
2	131 10.7	216 18.5	36.1	275 34.8	56.7	53 13.1	31.1	275 11.4	48.2	249 02.1	90	25 02.2	− 39
3	146 13.2	231 17.5	·· 36.1	290 35.8	·· 57.1	68 15.9	·· 31.1	290 13.7	·· 48.3	263 30.1	89	·25 06.1	− 38
4	161 15.6	246 16.5	36.1	305 36.8	57.6	83 18.7	31.0	305 16.0	48.3	277 58.0	88	25 09.9	− 37
5	176 18.1	261 15.6	36.1	320 37.9	58.1	98 21.4	31.0	320 18.2	48.4	292 25.8	87	25 13.6	− 36
6	191 20.5	276 14.6	−23 36.1	335 38.9	−12 58.6	113 24.2	+22 31.0	335 20.5	−11 48.4	306 53.5	87	−25 17.2	− 34
7	206 23.0	291 13.6	36.1	350 39.9	59.1	128 27.0	31.0	350 22.8	48.5	321 21.2	86	25 20.6	− 33
8	221 25.5	306 12.7	36.1	5 40.9	12 59.6	143 29.8	31.0	5 25.1	48.5	335 48.8	85	25 23.9	− 31
9	236 27.9	321 11.7	·· 36.1	20 41.9	·13 00.1	158 32.5	·· 31.0	20 27.4	·· 48.6	350 16.3	85	·25 27.0	− 30
10	251 30.4	336 10.7	36.0	35 43.0	00.6	173 35.3	30.9	35 29.7	48.6	4 43.8	84	25 30.0	− 29
11	266 32.9	351 09.8	36.0	50 44.0	01.1	188 38.1	30.9	50 31.9	48.7	19 11.2	83	25 32.9	− 27
12	281 35.3	6 08.8	−23 36.0	65 45.0	−13 01.6	203 40.9	+22 30.9	65 34.2	−11 48.7	33 38.5	83	−25 35.6	− 26
13	296 37.8	21 07.8	36.0	80 46.0	02.1	218 43.7	30.9	80 36.5	48.8	48 05.8	82	25 38.2	− 25
14	311 40.3	36 06.8	36.0	95 47.0	02.5	233 46.4	30.9	95 38.8	48.8	62 33.0	82	25 40.7	− 23
15	326 42.7	51 05.9	·· 35.9	110 48.1	·· 03.0	248 49.2	·· 30.9	110 41.1	·· 48.9	77 00.2	81	·25 43.0	− 22
16	341 45.2	66 04.9	35.9	125 49.1	03.5	263 52.0	30.8	125 43.4	48.9	91 27.3	80	25 45.2	− 21
17	356 47.7	81 03.9	35.9	140 50.1	04.0	278 54.8	30.8	140 45.6	49.0	105 54.3	80	25 47.3	− 19
18	11 50.1	96 03.0	−23 35.9	155 51.1	−13 04.5	293 57.5	+22 30.8	155 47.9	−11 49.0	120 21.3	79	−25 49.2	− 17
19	26 52.6	111 02.0	35.8	170 52.1	05.0	309 00.3	30.8	170 50.2	49.1	134 48.2	79	25 50.9	− 16
20	41 55.0	126 01.0	35.8	185 53.2	05.5	324 03.1	30.8	185 52.5	49.1	149 15.1	78	25 52.5	− 15
21	56 57.5	141 00.0	·· 35.8	200 54.2	·· 06.0	339 05.9	·· 30.8	200 54.8	·· 49.2	163 41.9	78	·25 54.0	− 13
22	72 00.0	155 59.1	35.7	215 55.2	06.5	354 08.6	30.7	215 57.1	49.2	178 08.7	77	25 55.3	− 12
23	87 02.4	170 58.1	35.7	230 56.2	06.9	9 11.4	30.7	230 59.3	49.3	192 35.4	77	25 56.5	− 11
3 0	102 04.9	185 57.1	−23 35.7	245 57.2	−13 07.4	24 14.2	+22 30.7	246 01.6	−11 49.3	207 02.1	76	−25 57.6	− 9
1	117 07.4	200 56.2	35.6	260 58.3	07.9	39 17.0	30.7	261 03.9	49.4	221 28.7	76	25 58.5	− 7
2	132 09.8	215 55.2	35.6	275 59.3	08.4	54 19.7	30.7	276 06.2	49.4	235 55.3	75	25 59.2	− 6
3	147 12.3	230 54.2	·· 35.6	291 00.3	·· 08.9	69 22.5	·· 30.7	291 08.5	·· 49.5	250 21.8	75	·25 59.8	− 5
4	162 14.8	245 53.3	35.5	306 01.3	09.4	84 25.3	30.7	306 10.8	49.5	264 48.3	75	26 00.3	− 3
5	177 17.2	260 52.3	35.5	321 02.3	09.9	99 28.1	30.6	321 13.1	49.6	279 14.8	74	26 00.6	− 1
6	192 19.7	275 51.3	−23 35.4	336 03.4	−13 10.4	114 30.8	+22 30.6	336 15.3	−11 49.6	293 41.2	74	−26 00.7	0
7	207 22.1	290 50.3	35.4	351 04.4	10.8	129 33.6	30.6	351 17.6	49.7	308 07.6	73	26 00.7	+ 1
8	222 24.6	305 49.4	35.4	6 05.4	11.3	144 36.4	30.6	6 19.9	49.7	322 33.9	73	26 00.6	+ 3
9	237 27.1	320 48.4	·· 35.3	21 06.4	·· 11.8	159 39.2	·· 30.6	21 22.2	·· 49.8	337 00.2	73	·26 00.3	+ 4
10	252 29.5	335 47.4	35.3	36 07.4	12.3	174 41.9	30.6	36 24.5	49.8	351 26.5	72	25 59.9	+ 6
11	267 32.0	350 46.5	35.2	51 08.5	12.8	189 44.7	30.5	51 26.8	49.9	5 52.7	72	25 59.3	+ 8
12	282 34.5	5 45.5	−23 35.2	66 09.5	−13 13.3	204 47.5	+22 30.5	66 29.1	−11 49.9	20 18.9	72	−25 58.5	+ 9
13	297 36.9	20 44.5	35.1	81 10.5	13.8	219 50.2	30.5	81 31.3	50.0	34 45.1	72	25 57.6	+ 10
14	312 39.4	35 43.6	35.1	96 11.5	14.2	234 53.0	30.5	96 33.6	50.0	49 11.3	71	25 56.6	+ 12
15	327 41.9	50 42.6	·· 35.0	111 12.5	·· 14.7	249 55.8	·· 30.5	111 35.9	·· 50.1	63 37.4	71	·25 55.4	+ 14
16	342 44.3	65 41.6	34.9	126 13.6	15.2	264 58.6	30.5	126 38.2	50.1	78 03.5	71	25 54.0	+ 15
17	357 46.8	80 40.7	34.9	141 14.6	15.7	280 01.3	30.4	141 40.5	50.2	92 29.6	70	25 52.5	+ 16
18	12 49.3	95 39.7	−23 34.8	156 15.6	−13 16.2	295 04.1	+22 30.4	156 42.8	−11 50.2	106 55.6	71	−25 50.9	+ 19
19	27 51.7	110 38.7	34.8	171 16.6	16.7	310 06.9	30.4	171 45.1	50.3	121 21.7	70	25 49.0	+ 19
20	42 54.2	125 37.7	34.7	186 17.6	17.2	325 09.6	30.4	186 47.4	50.3	135 47.7	70	25 47.1	+ 21
21	57 56.6	140 36.8	·· 34.7	201 18.6	·· 17.6	340 12.4	·· 30.4	201 49.6	·· 50.4	150 13.7	70	·25 45.0	+ 23
22	72 59.1	155 35.8	34.6	216 19.7	18.1	355 15.2	30.4	216 51.9	50.4	164 39.7	70	25 42.7	+ 24
23	88 01.6	170 34.8	34.5	231 20.7	18.6	10 17.9	30.3	231 54.2	50.5	179 05.7	70	25 40.3	+ 26
24	103 04.0	185 33.9	−23 34.5	246 21.7	−13 19.1	25 20.7	+22 30.3	246 56.5	−11 50.5	193 31.7	69	−25 37.7	+ 27
code	—	− 10	0	+ 10	− 5	+ 28	0	+ 23	− 1				

Day	GMT h	SUN GHA ° ′	SUN Dec. ° ′
1	0	179 11.2	−23 04.0
	1	194 10.9	03.8
	2	209 10.6	03.6
	3	224 10.3 ••	03.4
	4	239 10.0	03.2
	5	254 09.7	03.0
	6	269 09.4	−23 02.8
	7	284 09.1	02.6
	8	299 08.8	02.4
	9	314 08.5 ••	02.2
	10	329 08.2	02.0
	11	344 07.9	01.8
	12	359 07.6	−23 01.6
	13	14 07.3	01.4
	14	29 07.0	01.2
	15	44 06.7 ••	01.0
	16	59 06.4	00.8
	17	74 06.1	00.6
	18	89 05.8	−23 00.4
	19	104 05.5	00.2
	20	119 05.2	23 00.0
	21	134 04.9	• 22 59.8
	22	149 04.6	59.6
	23	164 04.3	59.3
2	0	179 04.0	−22 59.1
	1	194 03.8	58.9
	2	209 03.5	58.7
	3	224 03.2 ••	58.5
	4	239 02.9	58.3
	5	254 02.6	58.1
	6	269 02.3	−22 57.9
	7	284 02.0	57.6
	8	299 01.7	57.4
	9	314 01.4 ••	57.2
	10	329 01.1	57.0
	11	344 00.8	56.8
	12	359 00.5	−22 56.5
	13	14 00.2	56.3
	14	28 59.9	56.1
	15	43 59.6 ••	55.9
	16	58 59.3	55.7
	17	73 59.1	55.4
	18	88 58.8	−22 55.2
	19	103 58.5	55.0
	20	118 58.2	54.8
	21	133 57.9 ••	54.5
	22	148 57.6	54.3
	23	163 57.3	54.1
3	0	178 57.0	−22 53.8
	1	193 56.7	53.6
	2	208 56.4	53.4
	3	223 56.1 ••	53.1
	4	238 55.8	52.9
	5	253 55.6	52.7
	6	268 55.3	−22 52.4
	7	283 55.0	52.2
	8	298 54.7	52.0
	9	313 54.4 ••	51.7
	10	328 54.1	51.5
	11	343 53.8	51.3
	12	358 53.5	−22 51.0
	13	13 53.2	50.8
	14	28 52.9	50.5
	15	43 52.7 ••	50.3
	16	58 52.4	50.0
	17	73 52.1	49.8
	18	88 51.8	−22 49.6
	19	103 51.5	49.3
	20	118 51.2	49.1
	21	133 50.9 ••	48.8
	22	148 50.6	48.6
	23	163 50.3	48.3
	24	178 50.1	−22 48.1
code		−	+ 2

STARS No.	Name	SHA ° ′	Dec. ° ′
7	Acamar	315 51.8	−40 29.4
5	Achernar	335 59.5	−57 28.4
30	Acrux	173 59.4	−62 50.5
19	Adhara	255 47.2	−28 54.5
10	Aldebaran	291 40.3	+16 25.2
32	Alioth	166 59.6	+56 12.1
34	Alkaid	153 34.0	+49 32.2
55	Al Na'ir	28 39.8	−47 11.2
15	Alnilam	276 31.3	− 1 13.7
25	Alphard	218 39.6	− 8 27.5
41	Alphecca	126 49.0	+26 51.9
1	Alpheratz	358 29.8	+28 50.4
51	Altair	62 52.0	+ 8 44.7
2	Ankaa	353 59.5	−42 33.5
42	Antares	113 21.3	−26 19.9
37	Arcturus	146 36.5	+19 25.0
43	Atria	109 03.7	−68 56.7
22	Avior	234 35.8	−59 21.6
13	Bellatrix	279 19.5	+ 6 18.6
16	Betelg'se	271 49.2	+ 7 24.1
17	Canopus	264 15.4	−52 40.2
12	Capella	281 39.9	+45 57.4
53	Deneb	50 02.4	+45 07.0
28	Denebola	183 18.9	+14 49.5
4	Diphda	349 40.5	−18 14.3
27	Dubhe	194 45.7	+61 59.6
14	Elnath	279 08.6	+28 34.3
47	Eltanin	91 07.4	+51 29.5
54	Enif	34 31.1	+ 9 39.9
56	Fomalhaut	16 13.2	−29 52.1
31	Gacrux	172 50.8	−56 51.2
29	Gienah	176 38.2	−17 17.2
35	Hadar	149 51.6	−60 09.0
6	Hamal	328 51.0	+23 15.0
48	Kaus Aust.	84 43.3	−34 24.6
40	Kochab	137 18.3	+74 20.2
57	Markab	14 22.9	+14 57.6
8	Menkar	315 01.5	+ 3 54.7
36	Menkent	149 00.4	−36 08.6
24	Miapl'dus	221 48.7	−69 31.5
9	Mirfak	309 44.0	+49 42.2
50	Nunki	76 53.9	−26 21.4
52	Peacock	54 29.8	−56 53.2
21	Pollux	244 21.8	+28 08.3
20	Procyon	245 46.0	+ 5 20.6
46	R'alhague	96 48.1	+12 35.4
26	Regulus	208 30.7	+12 11.4
11	Rigel	281 54.6	− 8 15.2
38	Rigil Kent.	140 53.2	−60 38.7
44	Sabik	103 04.0	−15 40.2
3	Schedar	350 31.6	+56 17.5
45	Shaula	97 22.9	−37 04.4
18	Sirius	259 12.6	−16 39.1
33	Spica	159 18.3	−10 55.4
23	Suhail	223 25.0	−43 14.7
49	Vega	81 09.6	+38 44.3
39	Zub'g'bi	137 55.0	−15 51.2

Lat. °	Sunrise h m	Twlt. begins h m	Moonrise 1 h m	Moonrise 2 h m	Moonrise 3 h m	Moonrise 4 h m
N 72	■	6 55	■	■	■	■
70	■	6 46	■	■	■	■
68	■	6 39	■	■	■	■
66	10 27	6 33	8 03	■	■	■
64	9 49	6 28	6 57	8 53	■	10 27
62	9 23	6 22	6 22	7 51	9 01	9 37
60	9 02	6 19	5 56	7 18	8 23	9 06
58	8 45	6 14	5 36	6 53	7 57	8 42
56	8 31	6 11	5 20	6 33	7 36	8 23
54	8 19	6 06	5 06	6 17	7 18	8 07
52	8 08	6 03	4 54	6 02	7 03	7 53
50	7 59	6 00	4 43	5 50	6 50	7 41
45	7 38	5 52	4 21	5 25	6 24	7 16
40	7 22	5 45	4 03	5 04	6 03	6 56
35	7 08	5 38	3 48	4 47	5 45	6 39
30	6 56	5 31	3 35	4 33	5 30	6 24
20	6 35	5 17	3 13	4 08	5 05	6 00
10	6 17	5 02	2 54	3 47	4 43	5 38
0	6 00	4 45	2 36	3 27	4 22	5 19
10	5 43	4 26	2 18	3 08	4 02	4 59
20	5 24	4 00	1 59	2 47	3 40	4 37
30	5 03	3 26	1 38	2 23	3 14	4 12
35	4 50	3 03	1 25	2 08	2 59	3 58
40	4 35	2 32	1 11	1 52	2 42	3 41
45	4 18	1 47	0 54	1 32	2 21	3 21
50	3 56	////	0 33	1 08	1 55	2 55
52	3 45	////	0 23	0 56	1 42	2 43
54	3 33	////	0 11	0 43	1 28	2 29
56	3 19	////	24 28	0 28	1 11	2 12
58	3 03	////	24 09	0 09	0 50	1 52
60 S	2 44	////	23 47	24 25	0 25	1 28

Lat. °	Sunset h m	Twlt. ends h m	Moonset 1 h m	Moonset 2 h m	Moonset 3 h m	Moonset 4 h m
N 72	■	17 13	■	■	■	■
70	■	17 21	■	■	■	■
68	■	17 28	■	■	■	■
66	13 41	17 35	9 24	■	■	■
64	14 19	17 41	10 31	10 23	■	12 44
62	14 46	17 46	11 06	11 25	12 11	13 33
60	15 06	17 50	11 32	11 59	12 49	14 04
58	15 23	17 54	11 52	12 24	13 15	14 27
56	15 37	17 58	12 09	12 44	13 36	14 46
54	15 49	18 01	12 24	13 01	13 54	15 02
52	16 00	18 05	12 36	13 15	14 08	15 15
50	16 10	18 09	12 47	13 28	14 21	15 27
45	16 30	18 16	13 10	13 54	14 48	15 52
40	16 46	18 23	13 29	14 14	15 09	16 11
35	17 00	18 30	13 45	14 32	15 26	16 28
30	17 12	18 37	13 58	14 46	15 41	16 42
20	17 33	18 51	14 21	15 11	16 07	17 06
10	17 51	19 06	14 41	15 33	16 29	17 26
0	18 08	19 23	15 00	15 53	16 49	17 46
10	18 25	19 42	15 19	16 14	17 09	18 05
20	18 43	20 07	15 39	16 35	17 31	18 25
30	19 05	20 41	16 03	17 01	17 57	18 48
35	19 17	21 03	16 16	17 15	18 11	19 02
40	19 32	21 34	16 32	17 33	18 29	19 18
45	19 49	22 18	16 51	17 53	18 49	19 37
50	20 11	////	17 15	18 19	19 15	20 00
52	20 22	////	17 27	18 32	19 28	20 11
54	20 34	////	17 40	18 46	19 42	20 24
56	20 48	////	17 55	19 03	19 58	20 38
58	21 03	////	18 13	19 24	20 18	20 55
60 S	21 23	////	18 35	19 49	20 43	21 16

Equation of Time (App.—Mean)

GMT h	1 m s	2 m s	3 m s
0	− 3 14.7	− 3 43.2	− 4 11.4
6	− 3 21.9	− 3 50.3	− 4 18.4
12	− 3 29.0	− 3 57.3	− 4 25.3
18	− 3 36.1	− 4 04.4	− 4 32.3
24	− 3 43.2	− 4 11.4	− 4 39.2

GMT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
1	8 48	11 34	7 39	22 28	7 42
2	9 40	11 35	7 37	22 23	7 38
3	10 36	11 37	7 36	22 19	7 35
4	11 32	11 39	7 34	22 15	7 31

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0	0.6	0.1	0.1
30	0.6	0.1	0.1
45	0.6	0.1	0.0
60	0.6	0.0	0.0
75	0.6	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt. °	1 ′	2 ′	3 ′
0	13.5	14.3	15.2
4	13.5	14.3	15.2
8	13.5	14.3	15.2
12	13.6	14.3	15.2
16	13.6	14.3	15.2
20	13.6	14.4	15.2
24	13.7	14.4	15.2
28	13.7	14.4	15.2
32	13.8	14.4	15.2
36	13.9	14.5	15.2
40	13.9	14.5	15.2
44	14.0	14.6	15.3
48	14.1	14.6	15.3
52	14.2	14.7	15.3
56	14.3	14.7	15.3
60	14.4	14.8	15.3
64	14.5	14.9	15.3
68	14.6	14.9	15.4
72	14.7	15.0	15.4
76	14.8	15.1	15.4
80	14.9	15.1	15.4
84	15.0	15.2	15.4
88	15.1	15.3	15.5
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt. °	1 ′	2 ′	3 ′
0	16.7	16.3	15.8
4	16.7	16.3	15.8
8	16.7	16.3	15.8
12	16.7	16.2	15.8
16	16.6	16.2	15.8
20	16.6	16.2	15.7
24	16.6	16.2	15.7
28	16.5	16.1	15.7
32	16.4	16.1	15.7
36	16.4	16.1	15.7
40	16.3	16.0	15.7
44	16.2	16.0	15.7
48	16.1	15.9	15.7
52	16.1	15.9	15.6
56	16.0	15.8	15.6
60	15.9	15.7	15.6
64	15.8	15.7	15.6
68	15.7	15.6	15.6
72	15.6	15.6	15.6
76	15.4	15.5	15.5
80	15.3	15.4	15.5
84	15.2	15.3	15.5
88	15.1	15.3	15.5
90			

Subtract from table, back cover

New Year's Day 1

G M T	♈ GHA	VENUS −3.4 GHA	Dec.	MARS 1.5 GHA	Dec.	JUPITER −2.3 GHA	Dec.	SATURN 0.8 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
4 0	103 04.0	185 33.9	−23 34.5	246 21.7	−13 19.1	25 20.7	+22 30.3	246 56.5	−11 50.5	193 31.7	69	−25 37.7	+27
1	118 06.5	200 32.9	34.4	261 22.7	19.6	40 23.5	30.3	261 58.8	50.6	207 57.6	70	25 35.0	+29
2	133 09.0	215 31.9	34.3	276 23.7	20.1	55 26.2	30.3	277 01.1	50.6	222 23.6	69	25 32.1	+31
3	148 11.4	230 31.0	•• 34.3	291 24.8	•• 20.6	70 29.0	•• 30.3	292 03.4	•• 50.7	236 49.5	70	·25 29.0	+32
4	163 13.9	245 30.0	34.2	306 25.8	21.0	85 31.8	30.3	307 05.7	50.7	251 15.5	69	25 25.8	+33
5	178 16.4	260 29.0	34.1	321 26.8	21.5	100 34.6	30.2	322 07.9	50.8	265 41.4	70	25 22.5	+35
6	193 18.8	275 28.1	−23 34.0	336 27.8	−13 22.0	115 37.3	+22 30.2	337 10.2	−11 50.8	280 07.4	69	−25 19.0	+37
7	208 21.3	290 27.1	34.0	351 28.8	22.5	130 40.1	30.2	352 12.5	50.9	294 33.3	69	25 15.3	+38
8	223 23.8	305 26.1	33.9	6 29.9	23.0	145 42.9	30.2	7 14.8	50.9	308 59.2	70	25 11.5	+40
9	238 26.2	320 25.1	•• 33.8	21 30.9	•• 23.4	160 45.6	•• 30.2	22 17.1	•• 51.0	323 25.2	69	·25 07.5	+41
10	253 28.7	335 24.2	33.7	36 31.9	23.9	175 48.4	30.2	37 19.4	51.0	337 51.1	70	25 03.4	+42
11	268 31.1	350 23.2	33.7	51 32.9	24.4	190 51.2	30.1	52 21.7	51.1	352 17.1	70	24 59.2	+45
12	283 33.6	5 22.2	−23 33.6	66 33.9	−13 24.9	205 53.9	+22 30.1	67 24.0	−11 51.1	6 43.1	70	−24 54.7	+45
13	298 36.1	20 21.3	33.5	81 34.9	25.4	220 56.7	30.1	82 26.3	51.2	21 09.1	69	24 50.2	+48
14	313 38.5	35 20.3	33.4	96 36.0	25.9	235 59.5	30.1	97 28.6	51.2	35 35.0	71	24 45.4	+48
15	328 41.0	50 19.3	•• 33.3	111 37.0	•• 26.3	251 02.2	•• 30.1	112 30.8	•• 51.3	50 01.1	70	·24 40.6	+51
16	343 43.5	65 18.4	33.2	126 38.0	26.8	266 05.0	30.1	127 33.1	51.3	64 27.1	70	24 35.5	+51
17	358 45.9	80 17.4	33.2	141 39.0	27.3	281 07.7	30.0	142 35.4	51.4	78 53.1	71	24 30.4	+54
18	13 48.4	95 16.4	−23 33.1	156 40.0	−13 27.8	296 10.5	+22 30.0	157 37.7	−11 51.4	93 19.2	70	−24 25.0	+54
19	28 50.9	110 15.5	33.0	171 41.1	28.3	311 13.3	30.0	172 40.0	51.5	107 45.2	71	24 19.6	+57
20	43 53.3	125 14.5	32.9	186 42.1	28.7	326 16.0	30.0	187 42.3	51.5	122 11.3	71	24 13.9	+58
21	58 55.8	140 13.5	•• 32.8	201 43.1	•• 29.2	341 18.8	•• 30.0	202 44.6	•• 51.6	136 37.4	72	·24 08.1	+59
22	73 58.3	155 12.6	32.7	216 44.1	29.7	356 21.6	30.0	217 46.9	51.6	151 03.6	71	24 02.2	+61
23	89 00.7	170 11.6	32.6	231 45.1	30.2	11 24.3	30.0	232 49.2	51.7	165 29.7	72	23 56.1	+62
5 0	104 03.2	185 10.6	−23 32.5	246 46.2	−13 30.7	26 27.1	+22 29.9	247 51.5	−11 51.7	179 55.9	72	−23 49.9	+64
1	119 05.6	200 09.7	32.4	261 47.2	31.2	41 29.9	29.9	262 53.7	51.8	194 22.1	73	23 43.5	+65
2	134 08.1	215 08.7	32.3	276 48.2	31.6	56 32.6	29.9	277 56.0	51.8	208 48.4	72	23 37.0	+66
3	149 10.6	230 07.7	•• 32.2	291 49.2	•• 32.1	71 35.4	•• 29.9	292 58.3	•• 51.9	223 14.6	73	·23 30.4	+68
4	164 13.0	245 06.8	32.1	306 50.2	32.6	86 38.1	29.9	308 00.6	51.9	237 40.9	74	23 23.6	+70
5	179 15.5	260 05.8	32.0	321 51.2	33.1	101 40.9	29.9	323 02.9	52.0	252 07.3	73	23 16.6	+71
6	194 18.0	275 04.8	−23 31.9	336 52.3	−13 33.6	116 43.7	+22 29.8	338 05.2	−11 52.0	266 33.6	74	−23 09.5	+72
7	209 20.4	290 03.9	31.8	351 53.3	34.0	131 46.4	29.8	353 07.5	52.1	281 00.0	75	23 02.3	+74
8	224 22.9	305 02.9	31.7	6 54.3	34.5	146 49.2	29.8	8 09.8	52.1	295 26.5	74	22 54.9	+75
9	239 25.4	320 01.9	•• 31.6	21 55.3	•• 35.0	161 52.0	•• 29.8	23 12.1	•• 52.2	309 52.9	76	·22 47.4	+77
10	254 27.8	335 01.0	31.5	36 56.3	35.5	176 54.7	29.8	38 14.4	52.2	324 19.5	75	22 39.7	+78
11	269 30.3	350 00.0	31.4	51 57.4	35.9	191 57.5	29.8	53 16.7	52.2	338 46.0	76	22 31.9	+79
12	284 32.8	4 59.0	−23 31.3	66 58.4	−13 36.4	207 00.2	+22 29.7	68 19.0	−11 52.3	353 12.6	76	−22 24.0	+81
13	299 35.2	19 58.1	31.2	81 59.4	36.9	222 03.0	29.7	83 21.3	52.3	7 39.2	77	22 15.9	+82
14	314 37.7	34 57.1	31.0	97 00.4	37.4	237 05.8	29.7	98 23.6	52.4	22 05.9	77	22 07.7	+84
15	329 40.1	49 56.1	•• 30.9	112 01.4	•• 37.9	252 08.5	•• 29.7	113 25.8	•• 52.4	36 32.6	78	·21 59.3	+85
16	344 42.6	64 55.2	30.8	127 02.4	38.3	267 11.3	29.7	128 28.1	52.5	50 59.4	78	21 50.8	+86
17	359 45.1	79 54.2	30.7	142 03.5	38.8	282 14.0	29.7	143 30.4	52.5	65 26.2	78	21 42.2	+88
18	14 47.5	94 53.2	−23 30.6	157 04.5	−13 39.3	297 16.8	+22 29.6	158 32.7	−11 52.6	79 53.0	79	−21 33.4	+88
19	29 50.0	109 52.3	30.5	172 05.5	39.8	312 19.5	29.6	173 35.0	52.6	94 19.9	79	21 24.6	+91
20	44 52.5	124 51.3	30.3	187 06.5	40.2	327 22.3	29.6	188 37.3	52.7	108 46.8	80	21 15.5	+91
21	59 54.9	139 50.3	•• 30.2	202 07.5	•• 40.7	342 25.1	•• 29.6	203 39.6	•• 52.7	123 13.8	80	·21 06.4	+93
22	74 57.4	154 49.4	30.1	217 08.6	41.2	357 27.8	29.6	218 41.9	52.8	137 40.8	81	20 57.1	+94
23	89 59.9	169 48.4	30.0	232 09.6	41.7	12 30.6	29.6	233 44.2	52.8	152 07.9	81	20 47.7	+96
6 0	105 02.3	184 47.4	−23 29.8	247 10.6	−13 42.2	27 33.3	+22 29.6	248 46.5	−11 52.9	166 35.0	82	−20 38.1	+96
1	120 04.8	199 46.5	29.7	262 11.6	42.6	42 36.1	29.5	263 48.8	52.9	181 02.2	83	20 28.5	+98
2	135 07.2	214 45.5	29.6	277 12.6	43.1	57 38.9	29.5	278 51.1	53.0	195 29.5	82	20 18.7	+99
3	150 09.7	229 44.6	•• 29.5	292 13.6	•• 43.6	72 41.6	•• 29.5	293 53.4	•• 53.0	209 56.7	84	·20 08.8	+101
4	165 12.2	244 43.6	29.3	307 14.7	44.1	87 44.4	29.5	308 55.7	53.1	224 24.1	83	19 58.7	+101
5	180 14.6	259 42.6	29.2	322 15.7	44.5	102 47.1	29.5	323 58.0	53.1	238 51.4	85	19 48.6	+103
6	195 17.1	274 41.7	−23 29.1	337 16.7	−13 45.0	117 49.9	+22 29.5	339 00.3	−11 53.1	253 18.9	85	−19 38.3	+104
7	210 19.6	289 40.7	28.9	352 17.7	45.5	132 52.6	29.4	354 02.6	53.2	267 46.4	85	19 27.9	+105
8	225 22.0	304 39.7	28.8	7 18.7	46.0	147 55.4	29.4	9 04.9	53.2	282 13.9	86	19 17.4	+107
9	240 24.5	319 38.8	•• 28.7	22 19.7	•• 46.4	162 58.1	•• 29.4	24 07.1	•• 53.3	296 41.5	86	·19 06.7	+107
10	255 27.0	334 37.8	28.5	37 20.8	46.9	178 00.9	29.4	39 09.4	53.3	311 09.1	87	18 56.0	+109
11	270 29.4	349 36.8	28.4	52 21.8	47.4	193 03.6	29.4	54 11.7	53.4	325 36.8	88	18 45.1	+109
12	285 31.9	4 35.9	−23 28.2	67 22.8	−13 47.9	208 06.4	+22 29.4	69 14.0	−11 53.4	340 04.6	88	−18 34.2	+111
13	300 34.4	19 34.9	28.1	82 23.8	48.3	223 09.2	29.4	84 16.3	53.5	354 32.4	88	18 23.1	+112
14	315 36.8	34 34.0	27.9	97 24.8	48.8	238 11.9	29.3	99 18.6	53.5	9 00.2	90	18 11.9	+114
15	330 39.3	49 33.0	•• 27.8	112 25.9	•• 49.3	253 14.7	•• 29.3	114 20.9	•• 53.6	23 28.2	89	·18 00.5	+114
16	345 41.7	64 32.0	27.7	127 26.9	49.8	268 17.4	29.3	129 23.2	53.6	37 56.1	90	17 49.1	+115
17	0 44.2	79 31.1	27.5	142 27.9	50.2	283 20.2	29.3	144 25.5	53.7	52 24.1	91	17 37.6	+116
18	15 46.7	94 30.1	−23 27.4	157 28.9	−13 50.7	298 22.9	+22 29.3	159 27.8	−11 53.7	66 52.2	92	−17 26.0	+118
19	30 49.1	109 29.1	27.2	172 29.9	51.2	313 25.7	29.3	174 30.1	53.8	81 20.4	91	17 14.2	+118
20	45 51.6	124 28.2	27.1	187 30.9	51.6	328 28.4	29.2	189 32.4	53.8	95 48.5	93	17 02.4	+120
21	60 54.1	139 27.2	•• 26.9	202 32.0	•• 52.1	343 31.2	•• 29.2	204 34.7	•• 53.8	110 16.8	93	·16 50.4	+120
22	75 56.5	154 26.3	26.8	217 33.0	52.6	358 33.9	29.2	219 37.0	53.9	124 45.1	93	16 38.4	+122
23	90 59.0	169 25.3	26.6	232 34.0	53.1	13 36.7	29.2	234 39.3	53.9	139 13.4	94	16 26.2	+122
24	106 01.5	184 24.3	−23 26.4	247 35.0	−13 53.5	28 39.4	+22 29.2	249 41.6	−11 54.0	153 41.8	95	−16 14.0	+123
code	−	− 9	+ 1	+ 10	− 5	+ 28	0	+ 23	0				

GMT	h	SUN GHA	SUN Dec.
	h	° ′	° ′
4	0	178 50.1	−22 48.1
	1	193 49.8	47.8
	2	208 49.5	47.6
	3	223 49.2 ••	47.3
	4	238 48.9	47.1
	5	253 48.6	46.8
	6	268 48.3	−22 46.6
	7	283 48.0	46.3
	8	298 47.8	46.1
	9	313 47.5 ••	45.8
	10	328 47.2	45.5
	11	343 46.9	45.3
	12	358 46.6	−22 45.0
	13	13 46.3	44.8
	14	28 46.0	44.5
	15	43 45.8 ••	44.2
	16	58 45.5	44.0
	17	73 45.2	43.7
	18	88 44.9	−22 43.5
	19	103 44.6	43.2
	20	118 44.3	42.9
	21	133 44.0 ••	42.7
	22	148 43.8	42.4
	23	163 43.5	42.1
5	0	178 43.2	−22 41.9
	1	193 42.9	41.6
	2	208 42.6	41.3
	3	223 42.3 ••	41.1
	4	238 42.1	40.8
	5	253 41.8	40.5
	6	268 41.5	−22 40.2
	7	283 41.2	40.0
	8	298 40.9	39.7
	9	313 40.7 ••	39.4
	10	328 40.4	39.1
	11	343 40.1	38.9
	12	358 39.8	−22 38.6
	13	13 39.5	38.3
	14	28 39.2	38.0
	15	43 39.0 ••	37.8
	16	58 38.7	37.5
	17	73 38.4	37.2
	18	88 38.1	−22 36.9
	19	103 37.8	36.6
	20	118 37.6	36.3
	21	133 37.3 ••	36.1
	22	148 37.0	35.8
	23	163 36.7	35.5
6	0	178 36.4	−22 35.2
	1	193 36.2	34.9
	2	208 35.9	34.6
	3	223 35.6 ••	34.3
	4	238 35.3	34.0
	5	253 35.1	33.8
	6	268 34.8	−22 33.5
	7	283 34.5	33.2
	8	298 34.2	32.9
	9	313 33.9 ••	32.6
	10	328 33.7	32.3
	11	343 33.4	32.0
	12	358 33.1	−22 31.7
	13	13 32.8	31.4
	14	28 32.6	31.1
	15	43 32.3 ••	30.8
	16	58 32.0	30.5
	17	73 31.7	30.2
	18	88 31.5	−22 29.9
	19	103 31.2	29.6
	20	118 30.9	29.3
	21	133 30.6 ••	29.0
	22	148 30.4	28.7
	23	163 30.1	28.4
	24	178 29.8	−22 28.1
code		—	+ 3

No.	STARS Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.8	−40 29.4
5	Achernar	335 59.6	−57 28.4
30	Acrux	173 59.3	−62 50.5
19	Adhara	255 47.2	−28 54.5
10	Aldebaran	291 40.3	+16 25.2
32	Alioth	166 59.5	+56 12.1
34	Alkaid	153 33.9	+49 32.1
55	Al Na'ir	28 39.8	−47 11.2
15	Alnilam	276 31.3	− 1 13.8
25	Alphard	218 39.6	− 8 27.6
41	Alphecca	126 48.9	+26 51.8
1	Alpheratz	358 29.8	+28 50.4
51	Altair	62 52.0	+ 8 44.7
2	Ankaa	353 59.5	−42 33.5
42	Antares	113 21.3	−26 19.9
37	Arcturus	146 36.4	+19 25.0
43	Atria	109 03.7	−68 56.7
22	Avior	234 35.8	−59 21.6
13	Bellatrix	279 19.5	+ 6 18.6
16	Betelg'se	271 49.2	+ 7 24.0
17	Canopus	264 15.4	−52 40.2
12	Capella	281 39.9	+45 57.4
53	Deneb	50 02.4	+45 07.0
28	Denebola	183 18.9	+14 49.5
4	Diphda	349 40.5	−18 14.3
27	Dubhe	194 45.7	+61 59.6
14	Elnath	279 08.6	+28 34.3
47	Eltanin	91 07.4	+51 29.5
54	Enif	34 31.1	+ 9 39.9
56	Fomalhaut	16 13.2	−29 52.1
31	Gacrux	172 50.7	−56 51.2
29	Gienah	176 38.1	−17 17.2
35	Hadar	149 51.6	−60 09.0
6	Hamal	328 51.0	+23 15.0
48	Kaus Aust.	84 43.3	−34 24.5
40	Kochab	137 18.2	+74 20.2
57	Markab	14 22.9	+14 57.6
8	Menkar	315 01.5	+ 3 54.7
36	Menkent	149 00.4	−36 08.6
24	Miapl'dus	221 48.7	−69 31.5
9	Mirfak	309 44.0	+49 42.3
50	Nunki	76 53.9	−26 21.4
52	Peacock	54 29.8	−56 53.2
21	Pollux	244 21.8	+28 08.3
20	Procyon	245 46.0	+ 5 20.6
46	R'alhague	96 48.1	+12 35.4
26	Regulus	208 30.6	+12 11.4
11	Rigel	281 54.6	− 8 15.2
38	Rigil Kent.	140 53.1	−60 38.7
44	Sabik	103 04.0	−15 40.3
3	Schedar	350 31.6	+56 17.5
45	Shaula	97 22.8	−37 04.4
18	Sirius	259 12.6	−16 39.1
33	Spica	159 18.3	−10 55.4
23	Suhail	223 24.9	−43 14.7
49	Vega	81 09.6	+38 44.3
39	Zub'g'bi	137 55.0	−15 51.2

Lat.	Sunrise	Twlt. begins	Moonrise 4	Moonrise 5	Moonrise 6	Moonrise 7
N °	h m	h m	h m	h m	h m	h m
72	■	6 51	■	■	■	11 28
70	■	6 43	■	■	11 54	11 02
68	11 33	6 37	■	■	11 09	10 41
66	10 21	6 32	■	11 03	10 39	10 25
64	9 45	6 27	10 27	10 21	10 16	10 12
62	9 20	6 22	9 37	9 52	9 58	10 00
60	9 00	6 18	9 06	9 29	9 43	9 51
58	8 44	6 13	8 42	9 11	9 30	9 42
56	8 30	6 10	8 23	8 56	9 18	9 35
54	8 18	6 06	8 07	8 43	9 09	9 28
52	8 08	6 03	7 53	8 31	9 00	9 22
50	7 58	6 00	7 41	8 21	8 52	9 16
45	7 38	5 52	7 16	7 59	8 35	9 04
40	7 22	5 45	6 56	7 42	8 21	8 54
35	7 09	5 38	6 39	7 27	8 09	8 46
30	6 57	5 32	6 24	7 14	7 58	8 38
20	6 36	5 18	6 00	6 52	7 40	8 25
10	6 18	5 03	5 38	6 33	7 25	8 14
0	6 02	4 46	5 19	6 15	7 10	8 03
10	5 44	4 27	4 59	5 57	6 55	7 52
20	5 26	4 03	4 37	5 38	6 39	7 40
30	5 05	3 29	4 12	5 15	6 21	7 27
35	4 52	3 06	3 58	5 02	6 10	7 19
40	4 38	2 36	3 41	4 47	5 58	7 10
45	4 21	1 52	3 21	4 29	5 43	7 00
50	3 59	////	2 55	4 07	5 25	6 47
52	3 49	////	2 43	3 56	5 17	6 41
54	3 37	////	2 29	3 44	5 07	6 34
56	3 24	////	2 12	3 29	4 56	6 27
58	3 08	////	1 52	3 13	4 44	6 19
60	2 49	////	1 28	2 53	4 30	6 09
S						

Lat.	Sunset	Twlt. ends	Moonset 4	Moonset 5	Moonset 6	Moonset 7
N °	h m	h m	h m	h m	h m	h m
72	■	17 19	■	■	■	17 28
70	■	17 27	■	■	15 10	17 52
68	12 38	17 34	■	■	15 54	18 11
66	13 50	17 39	■	14 05	16 23	18 25
64	14 26	17 45	12 44	14 47	16 45	18 37
62	14 51	17 49	13 33	15 15	17 02	18 47
60	15 11	17 54	14 04	15 37	17 17	18 56
58	15 27	17 57	14 27	15 55	17 29	19 04
56	15 41	18 01	14 46	16 09	17 39	19 10
54	15 53	18 05	15 02	16 22	17 48	19 16
52	16 03	18 07	15 15	16 33	17 56	19 21
50	16 13	18 11	15 27	16 43	18 04	19 26
45	16 33	18 19	15 52	17 04	18 19	19 36
40	16 49	18 26	16 11	17 20	18 32	19 45
35	17 02	18 32	16 28	17 34	18 43	19 52
30	17 14	18 39	16 42	17 46	18 52	19 58
20	17 34	18 52	17 06	18 07	19 08	20 09
10	17 52	19 07	17 26	18 25	19 22	20 18
0	18 09	19 24	17 46	18 41	19 35	20 27
10	18 26	19 43	18 05	18 58	19 48	20 36
20	18 44	20 07	18 25	19 15	20 02	20 45
30	19 05	20 40	18 48	19 35	20 17	20 55
35	19 18	21 03	19 02	19 47	20 26	21 01
40	19 32	21 32	19 18	20 00	20 36	21 08
45	19 49	22 16	19 37	20 16	20 48	21 15
50	20 11	////	20 00	20 35	21 03	21 25
52	20 21	////	20 11	20 44	21 09	21 29
54	20 33	////	20 24	20 54	21 16	21 34
56	20 46	////	20 38	21 06	21 25	21 39
58	21 02	////	20 55	21 18	21 34	21 45
60	21 20	////	21 16	21 34	21 44	21 51
S						

GMT	Equation of Time (App.—Mean) 4	5	6
h	m s	m s	m s
0	− 4 39.2	− 5 06.7	− 5 33.7
6	− 4 46.1	− 5 13.4	− 5 40.4
12	− 4 53.0	− 5 20.2	− 5 47.0
18	− 4 59.8	− 5 27.0	− 5 53.6
24	− 5 06.7	− 5 33.7	− 6 00.2

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
4	11 32	11 39	7 34	22 15	7 31
5	12 28	11 40	7 32	22 10	7 27
6	13 23	11 42	7 31	22 06	7 24
7	14 15	11 43	7 29	22 01	7 20

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.6	0.1	0.1
30			
	0.6	0.1	0.1
45			
	0.6	0.1	0.0
60			
	0.6	0.0	0.0
75			
	0.6	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	4	5	6
°	′	′	′
0			
	15.9	16.7	17.5
4			
	15.9	16.7	17.5
8			
	15.9	16.7	17.4
12			
	15.9	16.7	17.4
16			
	15.9	16.7	17.4
20			
	15.9	16.6	17.4
24			
	15.9	16.6	17.3
28			
	15.9	16.6	17.3
32			
	15.9	16.5	17.2
36			
	15.9	16.5	17.1
40			
	15.9	16.5	17.1
44			
	15.8	16.4	17.0
48			
	15.8	16.4	16.9
52			
	15.8	16.3	16.8
56			
	15.8	16.3	16.8
60			
	15.8	16.2	16.7
64			
	15.8	16.2	16.6
68			
	15.7	16.1	16.5
72			
	15.7	16.0	16.4
76			
	15.7	16.0	16.3
80			
	15.7	15.9	16.2
84			
	15.7	15.9	16.1
88			
	15.6	15.8	16.0
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	4	5	6
°	′	′	′
0			
	15.3	14.9	14.5
4			
	15.3	14.9	14.5
8			
	15.3	14.9	14.5
12			
	15.3	14.9	14.5
16			
	15.3	14.9	14.5
20			
	15.4	15.0	14.6
24			
	15.4	15.0	14.6
28			
	15.4	15.0	14.7
32			
	15.4	15.0	14.7
36			
	15.4	15.1	14.8
40			
	15.4	15.1	14.8
44			
	15.4	15.2	14.9
48			
	15.4	15.2	15.0
52			
	15.5	15.3	15.1
56			
	15.5	15.3	15.2
60			
	15.5	15.4	15.3
64			
	15.5	15.4	15.3
68			
	15.5	15.5	15.4
72			
	15.5	15.5	15.5
76			
	15.6	15.6	15.6
80			
	15.6	15.7	15.8
84			
	15.6	15.7	15.9
88			
	15.6	15.8	15.9
90			

Subtract from table, back cover

New Moon 5
Epiphany 6

Day	GMT h	♈ GHA	VENUS − 3.4 GHA	Dec.	MARS 1.5 GHA	Dec.	JUPITER − 2.3 GHA	Dec.	SATURN 0.8 GHA	Dec.	MOON GHA	code	Dec.	code
		° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
7	0	106 01.5	184 24.3	−23 26.4	247 35.0	−13 53.5	28 39.4	+22 29.2	249 41.6	−11 54.0	153 41.8	95	−16 14.0	+123
	1	121 03.9	199 23.4	26.3	262 36.0	54.0	43 42.2	29.2	264 43.9	54.0	168 10.3	95	16 01.7	+125
	2	136 06.4	214 22.4	26.1	277 37.0	54.5	58 44.9	29.2	279 46.2	54.1	182 38.8	95	15 49.2	+125
	3	151 08.9	229 21.4	·· 26.0	292 38.1	·· 55.0	73 47.7	·· 29.1	294 48.5	·· 54.1	197 07.3	97	·15 36.7	+126
	4	166 11.3	244 20.5	25.8	307 39.1	55.4	88 50.4	29.1	309 50.8	54.2	211 36.0	96	15 24.1	+127
	5	181 13.8	259 19.5	25.6	322 40.1	55.9	103 53.2	29.1	324 53.1	54.2	226 04.6	97	15 11.4	+129
	6	196 16.2	274 18.6	−23 25.5	337 41.1	−13 56.4	118 55.9	+22 29.1	339 55.4	−11 54.3	240 33.3	98	−14 58.5	+128
	7	211 18.7	289 17.6	25.3	352 42.1	56.8	133 58.7	29.1	354 57.7	54.3	255 02.1	98	14 45.7	+130
	8	226 21.2	304 16.6	25.1	7 43.1	57.3	149 01.4	29.1	10 00.0	54.3	269 30.9	99	14 32.7	+131
	9	241 23.6	319 15.7	·· 25.0	22 44.2	·· 57.8	164 04.2	·· 29.0	25 02.3	·· 54.4	283 59.8	99	·14 19.6	+131
	10	256 26.1	334 14.7	24.8	37 45.2	58.2	179 06.9	29.0	40 04.6	54.4	298 28.7	100	14 06.5	+133
	11	271 28.6	349 13.8	24.6	52 46.2	58.7	194 09.7	29.0	55 06.9	54.5	312 57.7	100	13 53.2	+133
	12	286 31.0	4 12.8	−23 24.5	67 47.2	−13 59.2	209 12.4	+22 29.0	70 09.2	−11 54.5	327 26.7	101	−13 39.9	+134
	13	301 33.5	19 11.8	24.3	82 48.2	13 59.7	224 15.2	29.0	85 11.5	54.6	341 55.8	101	13 26.5	+134
	14	316 36.0	34 10.9	24.1	97 49.3	14 00.1	239 17.9	29.0	100 13.8	54.6	356 24.9	102	13 13.1	+136
	15	331 38.4	49 09.9	·· 23.9	112 50.3	·· 00.6	254 20.7	·· 29.0	115 16.1	·· 54.7	10 54.1	102	·12 59.5	+136
	16	346 40.9	64 09.0	23.8	127 51.3	01.1	269 23.4	28.9	130 18.4	54.7	25 23.3	103	12 45.9	+137
	17	1 43.4	79 08.0	23.6	142 52.3	01.5	284 26.2	28.9	145 20.7	54.8	39 52.6	103	12 32.2	+138
	18	16 45.8	94 07.1	−23 23.4	157 53.3	−14 02.0	299 28.9	+22 28.9	160 23.0	−11 54.8	54 21.9	104	−12 18.4	+138
	19	31 48.3	109 06.1	23.2	172 54.3	02.5	314 31.7	28.9	175 25.3	54.8	68 51.3	104	12 04.6	+139
	20	46 50.7	124 05.1	23.1	187 55.4	02.9	329 34.4	28.9	190 27.6	54.9	83 20.7	105	11 50.7	+140
	21	61 53.2	139 04.2	·· 22.9	202 56.4	·· 03.4	344 37.1	·· 28.9	205 29.9	·· 54.9	97 50.2	105	·11 36.7	+141
	22	76 55.7	154 03.2	22.7	217 57.4	03.9	359 39.9	28.8	220 32.2	55.0	112 19.7	105	11 22.6	+141
	23	91 58.1	169 02.3	22.5	232 58.4	04.4	14 42.6	28.8	235 34.5	55.0	126 49.2	106	11 08.5	+142
8	0	107 00.6	184 01.3	−23 22.3	247 59.4	−14 04.8	29 45.4	+22 28.8	250 36.8	−11 55.1	141 18.8	106	−10 54.3	+142
	1	122 03.1	199 00.3	22.1	263 00.4	05.3	44 48.1	28.8	265 39.1	55.1	155 48.4	107	10 40.1	+143
	2	137 05.5	213 59.4	21.9	278 01.5	05.8	59 50.9	28.8	280 41.4	55.2	170 18.1	107	10 25.8	+144
	3	152 08.0	228 58.4	·· 21.7	293 02.5	·· 06.2	74 53.6	·· 28.8	295 43.7	·· 55.2	184 47.8	108	·10 11.4	+144
	4	167 10.5	243 57.5	21.6	308 03.5	06.7	89 56.4	28.8	310 46.0	55.2	199 17.6	107	9 57.0	+145
	5	182 12.9	258 56.5	21.4	323 04.5	07.2	104 59.1	28.7	325 48.3	55.3	213 47.3	109	9 42.5	+145
	6	197 15.4	273 55.6	−23 21.2	338 05.5	−14 07.6	120 01.8	+22 28.7	340 50.6	−11 55.3	228 17.2	108	− 9 28.0	+146
	7	212 17.8	288 54.6	21.0	353 06.5	08.1	135 04.6	28.7	355 52.9	55.4	242 47.0	109	9 13.4	+146
	8	227 20.3	303 53.6	20.8	8 07.6	08.6	150 07.3	28.7	10 55.2	55.4	257 16.9	110	8 58.8	+147
	9	242 22.8	318 52.7	·· 20.6	23 08.6	·· 09.0	165 10.1	·· 28.7	25 57.5	·· 55.5	271 46.9	110	· 8 44.1	+147
	10	257 25.2	333 51.7	20.4	38 09.6	09.5	180 12.8	28.7	40 59.8	55.5	286 16.9	110	8 29.4	+148
	11	272 27.7	348 50.8	20.2	53 10.6	10.0	195 15.5	28.7	56 02.1	55.6	300 46.9	110	8 14.6	+149
	12	287 30.2	3 49.8	−23 20.0	68 11.6	−14 10.4	210 18.3	+22 28.6	71 04.4	−11 55.6	315 16.9	111	− 7 59.7	+148
	13	302 32.6	18 48.9	19.8	83 12.6	10.9	225 21.0	28.6	86 06.7	55.6	329 47.0	111	7 44.9	+150
	14	317 35.1	33 47.9	19.6	98 13.7	11.4	240 23.8	28.6	101 09.0	55.7	344 17.1	111	7 29.9	+149
	15	332 37.6	48 47.0	·· 19.4	113 14.7	·· 11.8	255 26.5	·· 28.6	116 11.3	·· 55.7	358 47.2	112	· 7 15.0	+150
	16	347 40.0	63 46.0	19.2	128 15.7	12.3	270 29.3	28.6	131 13.6	55.8	13 17.4	112	7 00.0	+151
	17	2 42.5	78 45.0	19.0	143 16.7	12.8	285 32.0	28.6	146 15.9	55.8	27 47.6	112	6 44.9	+151
	18	17 45.0	93 44.1	−23 18.7	158 17.7	−14 13.2	300 34.7	+22 28.5	161 18.2	−11 55.9	42 17.8	113	− 6 29.8	+151
	19	32 47.4	108 43.1	18.5	173 18.7	13.7	315 37.5	28.5	176 20.5	55.9	56 48.1	112	6 14.7	+151
	20	47 49.9	123 42.2	18.3	188 19.8	14.1	330 40.2	28.5	191 22.9	55.9	71 18.3	113	5 59.6	+152
	21	62 52.3	138 41.2	·· 18.1	203 20.8	·· 14.6	345 43.0	·· 28.5	206 25.2	·· 56.0	85 48.6	114	· 5 44.4	+153
	22	77 54.8	153 40.3	17.9	218 21.8	15.1	0 45.7	28.5	221 27.5	56.0	100 19.0	113	5 29.1	+152
	23	92 57.3	168 39.3	17.7	233 22.8	15.5	15 48.4	28.5	236 29.8	56.1	114 49.3	114	5 13.9	+153
9	0	107 59.7	183 38.4	−23 17.5	248 23.8	−14 16.0	30 51.2	+22 28.5	251 32.1	−11 56.1	129 19.7	114	− 4 58.6	+153
	1	123 02.2	198 37.4	17.2	263 24.8	16.5	45 53.9	28.4	266 34.4	56.2	143 50.1	114	4 43.3	+153
	2	138 04.7	213 36.5	17.0	278 25.9	16.9	60 56.6	28.4	281 36.7	56.2	158 20.5	114	4 28.0	+154
	3	153 07.1	228 35.5	·· 16.8	293 26.9	·· 17.4	75 59.4	·· 28.4	296 39.0	·· 56.3	172 50.9	115	· 4 12.6	+154
	4	168 09.6	243 34.6	16.6	308 27.9	17.9	91 02.1	28.4	311 41.3	56.3	187 21.4	114	3 57.2	+154
	5	183 12.1	258 33.6	16.4	323 28.9	18.3	106 04.9	28.4	326 43.6	56.3	201 51.8	115	3 41.8	+154
	6	198 14.5	273 32.7	−23 16.1	338 29.9	−14 18.8	121 07.6	+22 28.4	341 45.9	−11 56.4	216 22.3	115	− 3 26.4	+155
	7	213 17.0	288 31.7	15.9	353 30.9	19.3	136 10.3	28.4	356 48.2	56.4	230 52.8	115	3 10.9	+154
	8	228 19.5	303 30.7	15.7	8 32.0	19.7	151 13.1	28.3	11 50.5	56.5	245 23.3	115	2 55.5	+156
	9	243 21.9	318 29.8	·· 15.5	23 33.0	·· 20.2	166 15.8	·· 28.3	26 52.8	·· 56.5	259 53.8	115	· 2 40.0	+155
	10	258 24.4	333 28.8	15.2	38 34.0	20.6	181 18.5	28.3	41 55.1	56.6	274 24.3	116	2 24.5	+155
	11	273 26.8	348 27.9	15.0	53 35.0	21.1	196 21.3	28.3	56 57.4	56.6	288 54.9	115	2 09.0	+155
	12	288 29.3	3 26.9	−23 14.8	68 36.0	−14 21.6	211 24.0	+22 28.3	71 59.7	−11 56.6	303 25.4	116	− 1 53.5	+156
	13	303 31.8	18 26.0	14.5	83 37.0	22.0	226 26.7	28.3	87 02.0	56.7	317 56.0	115	1 37.9	+155
	14	318 34.2	33 25.0	14.3	98 38.1	22.5	241 29.5	28.3	102 04.4	56.7	332 26.5	116	1 22.4	+156
	15	333 36.7	48 24.1	·· 14.1	113 39.1	·· 22.9	256 32.2	·· 28.2	117 06.7	·· 56.8	346 57.1	116	· 1 06.8	+155
	16	348 39.2	63 23.1	13.8	128 40.1	23.4	271 34.9	28.2	132 09.0	56.8	1 27.7	116	0 51.3	+156
	17	3 41.6	78 22.2	13.6	143 41.1	23.9	286 37.7	28.2	147 11.3	56.9	15 58.3	115	0 35.7	+155
	18	18 44.1	93 21.2	−23 13.4	158 42.1	−14 24.3	301 40.4	+22 28.2	162 13.6	−11 56.9	30 28.8	116	− 0 20.2	+156
	19	33 46.6	108 20.3	13.1	173 43.1	24.8	316 43.1	28.2	177 15.9	56.9	44 59.4	116	− 0 04.6	+156
	20	48 49.0	123 19.3	12.9	188 44.2	25.3	331 45.9	28.2	192 18.2	57.0	59 30.0	116	+ 0 11.0	+155
	21	63 51.5	138 18.4	·· 12.6	203 45.2	·· 25.7	346 48.6	·· 28.2	207 20.5	·· 57.0	74 00.6	115	· 0 26.5	+156
	22	78 54.0	153 17.4	12.4	218 46.2	26.2	1 51.3	28.1	222 22.8	57.1	88 31.1	116	0 42.1	+156
	23	93 56.4	168 16.5	12.1	233 47.2	26.6	16 54.1	28.1	237 25.1	57.1	103 01.7	116	0 57.7	+155
	24	108 58.9	183 15.6	−23 11.9	248 48.2	−14 27.1	31 56.8	+22 28.1	252 27.4	−11 57.1	117 32.3	115	+ 1 13.2	+156
	code	—	− 9	+ 2	+ 10	− 5	+ 27	0	+ 23	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
7 0	178 29.8	−22 28.1
1	193 29.5	27.8
2	208 29.3	27.5
3	223 29.0 ••	27.2
4	238 28.7	26.9
5	253 28.4	26.6
6	268 28.2	−22 26.2
7	283 27.9	25.9
8	298 27.6	25.6
9	313 27.3 ••	25.3
10	328 27.1	25.0
11	343 26.8	24.7
12	358 26.5	−22 24.4
13	13 26.3	24.1
14	28 26.0	23.7
15	43 25.7 ••	23.4
16	58 25.4	23.1
17	73 25.2	22.8
18	88 24.9	−22 22.5
19	103 24.6	22.1
20	118 24.4	21.8
21	133 24.1 ••	21.5
22	148 23.8	21.2
23	163 23.6	20.9
8 0	178 23.3	−22 20.5
1	193 23.0	20.2
2	208 22.7	19.9
3	223 22.5 ••	19.6
4	238 22.2	19.2
5	253 21.9	18.9
6	268 21.7	−22 18.6
7	283 21.4	18.3
8	298 21.1	17.9
9	313 20.9 ••	17.6
10	328 20.6	17.3
11	343 20.3	16.9
12	358 20.1	−22 16.6
13	13 19.8	16.3
14	28 19.5	15.9
15	43 19.3 ••	15.6
16	58 19.0	15.3
17	73 18.7	14.9
18	88 18.5	−22 14.6
19	103 18.2	14.2
20	118 18.0	13.9
21	133 17.7 ••	13.6
22	148 17.4	13.2
23	163 17.2	12.9
9 0	178 16.9	−22 12.5
1	193 16.6	12.2
2	208 16.4	11.9
3	223 16.1 ••	11.5
4	238 15.8	11.2
5	253 15.6	10.8
6	268 15.3	−22 10.5
7	283 15.1	10.1
8	298 14.8	09.8
9	313 14.5 ••	09.4
10	328 14.3	09.1
11	343 14.0	08.7
12	358 13.8	−22 08.4
13	13 13.5	08.0
14	28 13.2	07.7
15	43 13.0 ••	07.3
16	58 12.7	07.0
17	73 12.5	06.6
18	88 12.2	−22 06.3
19	103 11.9	05.9
20	118 11.7	05.6
21	133 11.4 ••	05.2
22	148 11.2	04.8
23	163 10.9	04.5
24	178 10.6	−22 04.1
code	—	+ 3

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.8	−40 29.4
5	Achernar	335 59.6	−57 28.4
30	Acrux	173 59.3	−62 50.5
19	Adhara	255 47.2	−28 54.5
10	Aldebaran	291 40.3	+16 25.2
32	Alioth	166 59.5	+56 12.1
34	Alkaid	153 33.9	+49 32.1
55	Al Na'ir	28 39.8	−47 11.2
15	Alnilam	276 31.3	− 1 13.8
25	Alphard	218 39.6	− 8 27.6
41	Alphecca	126 48.9	+26 51.8
1	Alpheratz	358 29.8	+28 50.4
51	Altair	62 52.0	+ 8 44.7
2	Ankaa	353 59.6	−42 33.5
42	Antares	113 21.2	−26 19.9
37	Arcturus	146 36.4	+19 25.0
43	Atria	109 03.6	−68 56.7
22	Avior	234 35.8	−59 21.6
13	Bellatrix	279 19.5	+ 6 18.6
16	Betelg'se	271 49.2	+ 7 24.0
17	Canopus	264 15.4	−52 40.2
12	Capella	281 39.9	+45 57.4
53	Deneb	50 02.4	+45 07.0
28	Denebola	183 18.9	+14 49.5
4	Diphda	349 40.5	−18 14.3
27	Dubhe	194 45.6	+61 59.6
14	Elnath	279 08.6	+28 34.3
47	Eltanin	91 07.4	+51 29.5
54	Enif	34 31.1	+ 9 39.9
56	Fomalhaut	16 13.2	−29 52.1
31	Gacrux	172 50.7	−56 51.2
29	Gienah	176 38.1	−17 17.3
35	Hadar	149 51.5	−60 09.0
6	Hamal	328 51.0	+23 15.0
48	Kaus Aust.	84 43.3	−34 24.5
40	Kochab	137 18.2	+74 20.2
57	Markab	14 22.9	+14 57.6
8	Menkar	315 01.5	+ 3 54.7
36	Menkent	149 00.3	−36 08.6
24	Miapl'dus	221 48.7	−69 31.5
9	Mirfak	309 44.0	+49 42.3
50	Nunki	76 53.9	−26 21.4
52	Peacock	54 29.8	−56 53.2
21	Pollux	244 21.7	+28 08.3
20	Procyon	245 46.0	+ 5 20.6
46	R'alhague	96 48.1	+12 35.4
26	Regulus	208 30.6	+12 11.4
11	Rigel	281 54.6	− 8 15.2
38	Rigil Kent.	140 53.1	−60 38.7
44	Sabik	103 04.0	−15 40.3
3	Schedar	350 31.6	+56 17.5
45	Shaula	97 22.8	−37 04.4
18	Sirius	259 12.6	−16 39.1
33	Spica	159 18.3	−10 55.4
23	Suhail	223 24.9	−43 14.7
49	Vega	81 09.6	+38 44.3
39	Zub'g'bi	137 54.9	−15 51.2

Lat.	Sunrise	Twlt. begins	Moonrise 7	8	9	10
°	h m	h m	h m	h m	h m	h m
N 72	■	6 48	11 28	10 45	10 14	9 45
70	■	6 41	11 02	10 33	10 11	9 49
68	11 12	6 35	10 41	10 23	10 08	9 53
66	10 14	6 30	10 25	10 15	10 06	9 57
64	9 41	6 25	10 12	10 08	10 04	10 00
62	9 16	6 21	10 00	10 02	10 02	10 02
60	8 57	6 16	9 51	9 56	10 00	10 04
58	8 42	6 12	9 42	9 51	9 59	10 06
56	8 28	6 09	9 35	9 47	9 58	10 08
54	8 17	6 06	9 28	9 43	9 57	10 10
52	8 06	6 03	9 22	9 40	9 56	10 11
50	7 57	6 00	9 16	9 37	9 55	10 13
45	7 38	5 52	9 04	9 30	9 53	10 15
40	7 22	5 45	8 54	9 24	9 51	10 18
35	7 09	5 39	8 46	9 19	9 50	10 20
30	6 57	5 32	8 38	9 14	9 48	10 22
20	6 37	5 19	8 25	9 07	9 46	10 25
10	6 19	5 04	8 14	9 00	9 44	10 28
0	6 03	4 48	8 03	8 53	9 43	10 31
10	5 46	4 29	7 52	8 47	9 41	10 34
20	5 28	4 05	7 40	8 40	9 39	10 37
30	5 07	3 32	7 27	8 32	9 37	10 41
35	4 55	3 09	7 19	8 28	9 35	10 43
40	4 41	2 40	7 10	8 22	9 34	10 45
45	4 24	1 57	7 00	8 16	9 32	10 48
50	4 03	////	6 47	8 09	9 30	10 51
52	3 53	////	6 41	8 06	9 30	10 53
54	3 41	////	6 34	8 02	9 29	10 55
56	3 28	////	6 27	7 58	9 27	10 57
58	3 13	////	6 19	7 53	9 26	10 59
S 60	2 55	////	6 09	7 48	9 25	11 01

Lat.	Sunset	Twlt. ends	Moonset 7	8	9	10
°	h m	h m	h m	h m	h m	h m
N 72	■	17 25	17 28	19 57	22 14	24 32
70	■	17 32	17 52	20 06	22 13	24 20
68	13 02	17 39	18 11	20 14	22 12	24 11
66	14 00	17 44	18 25	20 20	22 12	24 03
64	14 33	17 49	18 37	20 25	22 11	23 57
62	14 57	17 53	18 47	20 30	22 11	23 52
60	15 16	17 57	18 56	20 34	22 10	23 47
58	15 32	18 01	19 04	20 37	22 10	23 43
56	15 45	18 04	19 10	20 40	22 09	23 39
54	15 57	18 08	19 16	20 43	22 09	23 36
52	16 07	18 11	19 21	20 45	22 09	23 33
50	16 16	18 14	19 26	20 48	22 09	23 30
45	16 36	18 22	19 36	20 52	22 08	23 24
40	16 51	18 28	19 45	20 56	22 08	23 19
35	17 05	18 35	19 52	21 00	22 07	23 15
30	17 16	18 41	19 58	21 03	22 07	23 12
20	17 36	18 54	20 09	21 08	22 07	23 05
10	17 54	19 09	20 18	21 13	22 06	23 00
0	18 10	19 24	20 27	21 17	22 05	22 54
10	18 27	19 44	20 36	21 21	22 05	22 49
20	18 45	20 08	20 45	21 25	22 04	22 44
30	19 05	20 40	20 55	21 30	22 04	22 37
35	19 18	21 02	21 01	21 33	22 03	22 34
40	19 32	21 31	21 08	21 36	22 03	22 30
45	19 49	22 14	21 15	21 40	22 02	22 25
50	20 09	////	21 25	21 44	22 02	22 20
52	20 19	////	21 29	21 46	22 01	22 17
54	20 31	////	21 34	21 48	22 01	22 14
56	20 44	////	21 39	21 50	22 01	22 11
58	20 59	////	21 45	21 53	22 00	22 08
S 60	21 17	////	21 51	21 56	22 00	22 04

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.6	0.1	0.1
30			
	0.6	0.1	0.1
45			
	0.6	0.1	0.1
60			
	0.6	0.0	0.0
75			
	0.6	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	7	8	9
°	′	′	′
0			
	17.8	18.2	18.5
4			
	17.8	18.2	18.5
8			
	17.8	18.2	18.4
12			
	17.8	18.2	18.4
16			
	17.8	18.1	18.4
20			
	17.7	18.1	18.3
24			
	17.7	18.0	18.2
28			
	17.6	17.9	18.2
32			
	17.5	17.9	18.1
36			
	17.5	17.8	18.0
40			
	17.4	17.7	17.9
44			
	17.3	17.6	17.8
48			
	17.2	17.5	17.7
52			
	17.1	17.4	17.5
56			
	17.0	17.2	17.4
60			
	16.9	17.1	17.3
64			
	16.8	17.0	17.1
68			
	16.7	16.8	17.0
72			
	16.5	16.7	16.8
76			
	16.4	16.6	16.7
80			
	16.3	16.4	16.5
84			
	16.2	16.3	16.3
88			
	16.1	16.2	16.2
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	7	8	9
°	′	′	′
0			
	14.2	14.0	13.9
4			
	14.3	14.0	13.9
8			
	14.3	14.1	13.9
12			
	14.3	14.1	13.9
16			
	14.3	14.1	14.0
20			
	14.4	14.2	14.0
24			
	14.4	14.2	14.1
28			
	14.5	14.3	14.2
32			
	14.5	14.4	14.3
36			
	14.6	14.5	14.4
40			
	14.7	14.6	14.5
44			
	14.8	14.7	14.6
48			
	14.9	14.8	14.7
52			
	15.0	14.9	14.8
56			
	15.1	15.0	15.0
60			
	15.2	15.1	15.1
64			
	15.3	15.3	15.2
68			
	15.4	15.4	15.4
72			
	15.5	15.5	15.5
76			
	15.7	15.7	15.7
80			
	15.8	15.8	15.9
84			
	15.9	16.0	16.0
88			
	16.0	16.1	16.1
90			

Subtract from table, back cover

Equation of Time (App.—Mean)

GMT	7	8	9
h	m s	m s	m s
0	− 6 00.2	− 6 26.3	− 6 51.9
6	− 6 06.8	− 6 32.8	− 6 58.2
12	− 6 13.3	− 6 39.2	− 7 04.5
18	− 6 19.9	− 6 45.5	− 7 10.7
24	− 6 26.3	− 6 51.9	− 7 16.9

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
7	14 15	11 43	7 29	22 01	7 20
8	15 05	11 45	7 28	21 57	7 16
9	15 54	11 46	7 26	21 53	7 13
10	16 43	11 48	7 24	21 48	7 09

GMT		♈ GHA	VENUS −3.5 GHA	Dec.	MARS 1.5 GHA	Dec.	JUPITER −2.3 GHA	Dec.	SATURN 0.8 GHA	Dec.	MOON GHA	code	Dec.	code
	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
10	0	108 58.9	183 15.6	−23 11.9	248 48.2	−14 27.1	31 56.8	+22 28.1	252 27.4	−11 57.1	117 32.3	115	+ 1 13.2	+156
	1	124 01.3	198 14.6	11.6	263 49.2	27.6	46 59.5	28.1	267 29.7	57.2	132 02.8	116	1 28.8	+155
	2	139 03.8	213 13.7	11.4	278 50.2	28.0	62 02.3	28.1	282 32.0	57.2	146 33.4	115	1 44.3	+155
	3	154 06.3	228 12.7	·· 11.1	293 51.3	·· 28.5	77 05.0	·· 28.1	297 34.4	·· 57.3	161 03.9	116	· 1 59.8	+156
	4	169 08.7	243 11.8	10.9	308 52.3	28.9	92 07.7	28.1	312 36.7	57.3	175 34.5	115	2 15.4	+155
	5	184 11.2	258 10.8	10.6	323 53.3	29.4	107 10.4	28.0	327 39.0	57.4	190 05.0	115	2 30.9	+155
	6	199 13.7	273 09.9	−23 10.4	338 54.3	−14 29.9	122 13.2	+22 28.0	342 41.3	−11 57.4	204 35.5	115	+ 2 46.4	+154
	7	214 16.1	288 08.9	10.1	353 55.3	30.3	137 15.9	28.0	357 43.6	57.4	219 06.0	115	3 01.8	+155
	8	229 18.6	303 08.0	09.9	8 56.3	30.8	152 18.6	28.0	12 45.9	57.5	233 36.5	115	3 17.3	+155
	9	244 21.1	318 07.0	·· 09.6	23 57.4	·· 31.2	167 21.4	·· 28.0	27 48.2	·· 57.5	248 07.0	114	· 3 32.8	+154
	10	259 23.5	333 06.1	09.4	38 58.4	31.7	182 24.1	28.0	42 50.5	57.6	262 37.4	115	3 48.2	+154
	11	274 26.0	348 05.1	09.1	53 59.4	32.1	197 26.8	28.0	57 52.8	57.6	277 07.9	114	4 03.6	+154
	12	289 28.4	3 04.2	−23 08.8	69 00.4	−14 32.6	212 29.5	+22 27.9	72 55.1	−11 57.6	291 38.3	114	+ 4 19.0	+153
	13	304 30.9	18 03.2	08.6	84 01.4	33.1	227 32.3	27.9	87 57.4	57.7	306 08.7	114	4 34.3	+154
	14	319 33.4	33 02.3	08.3	99 02.4	33.5	242 35.0	27.9	102 59.8	57.7	320 39.1	113	4 49.7	+153
	15	334 35.8	48 01.4	·· 08.0	114 03.5	·· 34.0	257 37.7	·· 27.9	118 02.1	·· 57.8	335 09.4	114	· 5 05.0	+153
	16	349 38.3	63 00.4	07.8	129 04.5	34.4	272 40.4	27.9	133 04.4	57.8	349 39.8	113	5 20.3	+152
	17	4 40.8	77 59.5	07.5	144 05.5	34.9	287 43.2	27.9	148 06.7	57.9	4 10.1	112	5 35.5	+152
	18	19 43.2	92 58.5	−23 07.2	159 06.5	−14 35.3	302 45.9	+22 27.9	163 09.0	−11 57.9	18 40.3	113	+ 5 50.7	+152
	19	34 45.7	107 57.6	07.0	174 07.5	35.8	317 48.6	27.8	178 11.3	57.9	33 10.6	112	6 05.9	+152
	20	49 48.2	122 56.6	06.7	189 08.5	36.3	332 51.4	27.8	193 13.6	58.0	47 40.8	112	6 21.1	+151
	21	64 50.6	137 55.7	·· 06.4	204 09.6	·· 36.7	347 54.1	·· 27.8	208 15.9	·· 58.0	62 11.0	112	· 6 36.2	+151
	22	79 53.1	152 54.7	06.2	219 10.6	37.2	2 56.8	27.8	223 18.2	58.1	76 41.2	112	6 51.3	+151
	23	94 55.6	167 53.8	05.9	234 11.6	37.6	17 59.5	27.8	238 20.6	58.1	91 11.4	111	7 06.4	+150
11	0	109 58.0	182 52.9	−23 05.6	249 12.6	−14 38.1	33 02.3	+22 27.8	253 22.9	−11 58.1	105 41.5	110	+ 7 21.4	+149
	1	125 00.5	197 51.9	05.3	264 13.6	38.5	48 05.0	27.8	268 25.2	58.2	120 11.5	111	7 36.3	+150
	2	140 02.9	212 51.0	05.0	279 14.6	39.0	63 07.7	27.8	283 27.5	58.2	134 41.6	110	7 51.3	+149
	3	155 05.4	227 50.0	·· 04.8	294 15.6	·· 39.5	78 10.4	·· 27.7	298 29.8	·· 58.3	149 11.6	110	· 8 06.2	+148
	4	170 07.9	242 49.1	04.5	309 16.7	39.9	93 13.1	27.7	313 32.1	58.3	163 41.6	109	8 21.0	+148
	5	185 10.3	257 48.2	04.2	324 17.7	40.4	108 15.9	27.7	328 34.4	58.3	178 11.5	109	8 35.8	+147
	6	200 12.8	272 47.2	−23 03.9	339 18.7	−14 40.8	123 18.6	+22 27.7	343 36.7	−11 58.4	192 41.4	109	+ 8 50.5	+147
	7	215 15.3	287 46.3	03.6	354 19.7	41.3	138 21.3	27.7	358 39.1	58.4	207 11.3	108	9 05.2	+147
	8	230 17.7	302 45.3	03.3	9 20.7	41.7	153 24.0	27.7	13 41.4	58.5	221 41.1	108	9 19.9	+146
	9	245 20.2	317 44.4	·· 03.1	24 21.7	·· 42.2	168 26.8	·· 27.7	28 43.7	·· 58.5	236 10.9	107	· 9 34.5	+145
	10	260 22.7	332 43.5	02.8	39 22.8	42.6	183 29.5	27.6	43 46.0	58.5	250 40.6	107	9 49.0	+145
	11	275 25.1	347 42.5	02.5	54 23.8	43.1	198 32.2	27.6	58 48.3	58.6	265 10.3	106	10 03.5	+144
	12	290 27.6	2 41.6	−23 02.2	69 24.8	−14 43.5	213 34.9	+22 27.6	73 50.6	−11 58.6	279 39.9	106	+10 17.9	+144
	13	305 30.0	17 40.6	01.9	84 25.8	44.0	228 37.6	27.6	88 52.9	58.7	294 09.5	106	10 32.3	+143
	14	320 32.5	32 39.7	01.6	99 26.8	44.4	243 40.4	27.6	103 55.2	58.7	308 39.1	105	10 46.6	+143
	15	335 35.0	47 38.8	·· 01.3	114 27.8	·· 44.9	258 43.1	·· 27.6	118 57.6	·· 58.7	323 08.6	104	·11 00.9	+142
	16	350 37.4	62 37.8	01.0	129 28.8	45.4	273 45.8	27.6	133 59.9	58.8	337 38.0	105	11 15.1	+141
	17	5 39.9	77 36.9	00.7	144 29.9	45.8	288 48.5	27.5	149 02.2	58.8	352 07.5	103	11 29.2	+141
	18	20 42.4	92 35.9	−23 00.4	159 30.9	−14 46.3	303 51.2	+22 27.5	164 04.5	−11 58.9	6 36.8	103	+11 43.3	+140
	19	35 44.8	107 35.0	23 00.1	174 31.9	46.7	318 54.0	27.5	179 06.8	58.9	21 06.1	103	11 57.3	+139
	20	50 47.3	122 34.1	22 59.8	189 32.9	47.2	333 56.7	27.5	194 09.1	58.9	35 35.4	102	12 11.2	+139
	21	65 49.8	137 33.1	·· 59.5	204 33.9	·· 47.6	348 59.4	·· 27.5	209 11.4	·· 59.0	50 04.6	102	·12 25.1	+138
	22	80 52.2	152 32.2	59.2	219 34.9	48.1	4 02.1	27.5	224 13.8	59.0	64 33.8	101	12 38.9	+137
	23	95 54.7	167 31.3	58.9	234 36.0	48.5	19 04.8	27.5	239 16.1	59.1	79 02.9	100	12 52.6	+137
12	0	110 57.2	182 30.3	−22 58.6	249 37.0	−14 49.0	34 07.5	+22 27.5	254 18.4	−11 59.1	93 31.9	100	+13 06.3	+136
	1	125 59.6	197 29.4	58.3	264 38.0	49.4	49 10.3	27.4	269 20.7	59.1	108 00.9	99	13 19.9	+135
	2	141 02.1	212 28.4	58.0	279 39.0	49.9	64 13.0	27.4	284 23.0	59.2	122 29.8	99	13 33.4	+134
	3	156 04.5	227 27.5	·· 57.7	294 40.0	·· 50.3	79 15.7	·· 27.4	299 25.3	·· 59.2	136 58.7	98	·13 46.8	+133
	4	171 07.0	242 26.6	57.4	309 41.0	50.8	94 18.4	27.4	314 27.7	59.3	151 27.5	98	14 00.1	+133
	5	186 09.5	257 25.6	57.1	324 42.1	51.2	109 21.1	27.4	329 30.0	59.3	165 56.3	97	14 13.4	+132
	6	201 11.9	272 24.7	−22 56.7	339 43.1	−14 51.7	124 23.8	+22 27.4	344 32.3	−11 59.3	180 25.0	96	+14 26.6	+131
	7	216 14.4	287 23.8	56.4	354 44.1	52.1	139 26.5	27.4	359 34.6	59.4	194 53.6	96	14 39.7	+130
	8	231 16.9	302 22.8	56.1	9 45.1	52.6	154 29.3	27.3	14 36.9	59.4	209 22.2	95	14 52.7	+129
	9	246 19.3	317 21.9	·· 55.8	24 46.1	·· 53.0	169 32.0	·· 27.3	29 39.2	·· 59.5	223 50.7	95	·15 05.6	+129
	10	261 21.8	332 21.0	55.5	39 47.1	53.5	184 34.7	27.3	44 41.6	59.5	238 19.2	94	15 18.5	+127
	11	276 24.3	347 20.0	55.2	54 48.1	53.9	199 37.4	27.3	59 43.9	59.5	252 47.6	93	15 31.2	+127
	12	291 26.7	2 19.1	−22 54.8	69 49.2	−14 54.4	214 40.1	+22 27.3	74 46.2	−11 59.6	267 15.9	93	+15 43.9	+126
	13	306 29.2	17 18.2	54.5	84 50.2	54.8	229 42.8	27.3	89 48.5	59.6	281 44.2	92	15 56.5	+125
	14	321 31.7	32 17.2	54.2	99 51.2	55.3	244 45.5	27.3	104 50.8	59.6	296 12.4	91	16 09.0	+124
	15	336 34.1	47 16.3	·· 53.9	114 52.2	·· 55.7	259 48.3	·· 27.3	119 53.1	·· 59.7	310 40.5	91	·16 21.4	+123
	16	351 36.6	62 15.4	53.5	129 53.2	56.2	274 51.0	27.2	134 55.5	59.7	325 08.6	90	16 33.7	+121
	17	6 39.0	77 14.4	53.2	144 54.2	56.6	289 53.7	27.2	149 57.8	59.8	339 36.6	89	16 45.8	+121
	18	21 41.5	92 13.5	−22 52.9	159 55.2	−14 57.1	304 56.4	+22 27.2	165 00.1	−11 59.8	354 04.5	89	+16 57.9	+120
	19	36 44.0	107 12.6	52.6	174 56.3	57.5	319 59.1	27.2	180 02.4	59.8	8 32.4	88	17 09.9	+119
	20	51 46.4	122 11.6	52.2	189 57.3	58.0	335 01.8	27.2	195 04.7	59.9	23 00.2	88	17 21.8	+118
	21	66 48.9	137 10.7	·· 51.9	204 58.3	·· 58.4	350 04.5	·· 27.2	210 07.0	·11 59.9	37 28.0	86	·17 33.6	+117
	22	81 51.4	152 09.8	51.6	219 59.3	58.9	5 07.2	27.2	225 09.4	12 00.0	51 55.6	86	17 45.3	+116
	23	96 53.8	167 08.9	51.2	235 00.3	59.3	20 09.9	27.2	240 11.7	00.0	66 23.2	86	17 56.9	+115
	24	111 56.3	182 07.9	−22 50.9	250 01.3	−14 59.8	35 12.7	+22 27.1	255 14.0	−12 00.0	80 50.8	85	+18 08.4	+114
	code	—	− 10	+ 3	+ 10	− 5	+ 27	0	+ 23	− 1				

GMT		SUN GHA	Dec.
	h	° ′	° ′
10	0	178 10.6	−22 04.1
	1	193 10.4	03.8
	2	208 10.1	03.4
	3	223 09.9 ··	03.0
	4	238 09.6	02.7
	5	253 09.4	02.3
	6	268 09.1	−22 01.9
	7	283 08.8	01.6
	8	298 08.6	01.2
	9	313 08.3 ··	00.8
	10	328 08.1	00.5
	11	343 07.8	22 00.1
	12	358 07.6	−21 59.7
	13	13 07.3	59.4
	14	28 07.1	59.0
	15	43 06.8 ··	58.6
	16	58 06.6	58.3
	17	73 06.3	57.9
	18	88 06.0	−21 57.5
	19	103 05.8	57.1
	20	118 05.5	56.8
	21	133 05.3 ··	56.4
	22	148 05.0	56.0
	23	163 04.8	55.6
11	0	178 04.5	−21 55.3
	1	193 04.3	54.9
	2	208 04.0	54.5
	3	223 03.8 ··	54.1
	4	238 03.5	53.7
	5	253 03.3	53.4
	6	268 03.0	−21 53.0
	7	283 02.8	52.6
	8	298 02.5	52.2
	9	313 02.3 ··	51.8
	10	328 02.0	51.4
	11	343 01.8	51.1
	12	358 01.5	−21 50.7
	13	13 01.3	50.3
	14	28 01.0	49.9
	15	43 00.8 ··	49.5
	16	58 00.5	49.1
	17	73 00.3	48.7
	18	88 00.0	−21 48.3
	19	102 59.8	47.9
	20	117 59.6	47.6
	21	132 59.3 ··	47.2
	22	147 59.1	46.8
	23	162 58.8	46.4
12	0	177 58.6	−21 46.0
	1	192 58.3	45.6
	2	207 58.1	45.2
	3	222 57.8 ··	44.8
	4	237 57.6	44.4
	5	252 57.4	44.0
	6	267 57.1	−21 43.6
	7	282 56.9	43.2
	8	297 56.6	42.8
	9	312 56.4 ··	42.4
	10	327 56.1	42.0
	11	342 55.9	41.6
	12	357 55.6	−21 41.2
	13	12 55.4	40.8
	14	27 55.2	40.4
	15	42 54.9 ··	40.0
	16	57 54.7	39.6
	17	72 54.4	39.2
	18	87 54.2	−21 38.7
	19	102 54.0	38.3
	20	117 53.7	37.9
	21	132 53.5 ··	37.5
	22	147 53.2	37.1
	23	162 53.0	36.7
	24	177 52.8	−21 36.3
code		—	+ 4

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.8	−40 29.4
5	Achernar	335 59.6	−57 28.4
30	Acrux	173 59.2	−62 50.5
19	Adhara	255 47.2	−28 54.5
10	Aldebaran	291 40.3	+16 25.2
32	Alioth	166 59.5	+56 12.1
34	Alkaid	153 33.9	+49 32.1
55	Al Na'ir	28 39.8	−47 11.2
15	Alnilam	276 31.3	− 1 13.8
25	Alphard	218 39.6	− 8 27.6
41	Alphecca	126 48.9	+26 51.8
1	Alpheratz	358 29.8	+28 50.4
51	Altair	62 52.0	+ 8 44.7
2	Ankaa	353 59.6	−42 33.5
42	Antares	113 21.2	−26 19.9
37	Arcturus	146 36.4	+19 25.0
43	Atria	109 03.6	−68 56.7
22	Avior	234 35.7	−59 21.6
13	Bellatrix	279 19.5	+ 6 18.6
16	Betelg'se	271 49.2	+ 7 24.0
17	Canopus	264 15.4	−52 40.2
12	Capella	281 39.9	+45 57.4
53	Deneb	50 02.4	+45 07.0
28	Denebola	183 18.9	+14 49.5
4	Diphda	349 40.6	−18 14.3
27	Dubhe	194 45.6	+61 59.6
14	Elnath	279 08.6	+28 34.3
47	Eltanin	91 07.3	+51 29.4
54	Enif	34 31.1	+ 9 39.8
56	Fomalhaut	16 13.2	−29 52.1
31	Gacrux	172 50.6	−56 51.2
29	Gienah	176 38.1	−17 17.3
35	Hadar	149 51.5	−60 09.0
6	Hamal	328 51.0	+23 15.0
48	Kaus Aust.	84 43.3	−34 24.5
40	Kochab	137 18.1	+74 20.2
57	Markab	14 22.9	+14 57.6
8	Menkar	315 01.5	+ 3 54.7
36	Menkent	149 00.3	−36 08.6
24	Miapl'dus	221 48.6	−69 31.6
9	Mirfak	309 44.0	+49 42.3
50	Nunki	76 53.8	−26 21.4
52	Peacock	54 29.8	−56 53.1
21	Pollux	244 21.7	+28 08.3
20	Procyon	245 46.0	+ 5 20.6
46	R'alhague	96 48.1	+12 35.4
26	Regulus	208 30.6	+12 11.4
11	Rigel	281 54.6	− 8 15.2
38	Rigil Kent.	140 53.0	−60 38.7
44	Sabik	103 03.9	−15 40.3
3	Schedar	350 31.7	+56 17.5
45	Shaula	97 22.8	−37 04.4
18	Sirius	259 12.6	−16 39.1
33	Spica	159 18.2	−10 55.4
23	Suhail	223 24.9	−43 14.7
49	Vega	81 09.6	+38 44.3
39	Zub'g'bi	137 54.9	−15 51.2

Lat.	Sunrise	Twlt. begins	Moonrise 10	11	12	13
N °	h m	h m	h m	h m	h m	h m
72	■	6 44	9 45	9 12	8 26	□
70	■	6 38	9 49	9 26	8 56	7 50
68	10 55	6 32	9 53	9 38	9 19	8 49
66	10 06	6 27	9 57	9 47	9 37	9 23
64	9 35	6 23	10 00	9 56	9 52	9 48
62	9 12	6 19	10 02	10 03	10 04	10 08
60	8 54	6 15	10 04	10 09	10 15	10 24
58	8 39	6 12	10 06	10 14	10 24	10 38
56	8 26	6 08	10 08	10 19	10 33	10 50
54	8 15	6 05	10 10	10 24	10 40	11 01
52	8 05	6 02	10 11	10 28	10 47	11 10
50	7 56	5 59	10 13	10 31	10 53	11 19
45	7 37	5 52	10 15	10 39	11 05	11 37
40	7 22	5 46	10 18	10 46	11 16	11 51
35	7 09	5 39	10 20	10 51	11 25	12 04
30	6 57	5 32	10 22	10 57	11 34	12 15
20	6 38	5 19	10 25	11 05	11 48	12 34
10	6 20	5 05	10 28	11 13	12 00	12 50
0	6 04	4 50	10 31	11 21	12 12	13 06
10	5 48	4 30	10 34	11 28	12 24	13 22
20	5 30	4 06	10 37	11 36	12 37	13 39
30	5 10	3 35	10 41	11 46	12 51	13 58
35	4 58	3 13	10 43	11 51	13 00	14 10
40	4 44	2 45	10 45	11 57	13 10	14 23
45	4 28	2 03	10 48	12 04	13 22	14 39
50	4 07	0 20	10 51	12 13	13 36	14 58
52	3 57	////	10 53	12 17	13 42	15 07
54	3 46	////	10 55	12 22	13 50	15 18
56	3 34	////	10 57	12 27	13 58	15 30
58	3 19	////	10 59	12 32	14 08	15 43
60 S	3 01	////	11 01	12 39	14 18	16 00

Lat.	Sunset	Twlt. ends	Moonset 10	11	12	13
N °	h m	h m	h m	h m	h m	h m
72	■	17 32	24 32	0 32	3 06	□
70	■	17 38	24 20	0 20	2 37	5 35
68	13 21	17 44	24 11	0 11	2 16	4 38
66	14 10	17 49	24 03	0 03	1 59	4 04
64	14 41	17 54	23 57	25 46	1 46	3 40
62	15 04	17 58	23 52	25 35	1 35	3 21
60	15 22	18 02	23 47	25 25	1 25	3 06
58	15 37	18 05	23 43	25 17	1 17	2 52
56	15 50	18 08	23 39	25 10	1 10	2 41
54	16 02	18 12	23 36	25 03	1 03	2 31
52	16 11	18 14	23 33	24 57	0 57	2 23
50	16 20	18 17	23 30	24 52	0 52	2 15
45	16 39	18 24	23 24	24 41	0 41	1 58
40	16 55	18 31	23 19	24 32	0 32	1 45
35	17 08	18 38	23 15	24 24	0 24	1 33
30	17 19	18 43	23 12	24 17	0 17	1 23
20	17 38	18 56	23 05	24 05	0 05	1 06
10	17 55	19 10	23 00	23 54	24 51	0 51
0	18 12	19 26	22 54	23 45	24 37	0 37
10	18 28	19 45	22 49	23 35	24 24	0 24
20	18 45	20 08	22 44	23 25	24 09	0 09
30	19 05	20 39	22 37	23 13	23 52	24 36
35	19 17	21 01	22 34	23 06	23 42	24 24
40	19 31	21 29	22 30	22 59	23 31	24 09
45	19 48	22 10	22 25	22 50	23 18	23 53
50	20 08	23 41	22 20	22 39	23 03	23 32
52	20 18	////	22 17	22 34	22 55	23 22
54	20 29	////	22 14	22 29	22 47	23 12
56	20 41	////	22 11	22 23	22 38	22 59
58	20 56	////	22 08	22 16	22 28	22 45
60 S	21 13	////	22 04	22 09	22 16	22 28

GMT	Equation of Time (App.—Mean) 10	11	12
h	m s	m s	m s
0	− 7 16.9	− 7 41.4	− 8 05.2
6	− 7 23.1	− 7 47.4	− 8 11.1
12	− 7 29.2	− 7 53.4	− 8 16.9
18	− 7 35.3	− 7 59.3	− 8 22.7
24	− 7 41.4	− 8 05.2	− 8 28.5

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
10	16 43	11 48	7 24	21 48	7 09
11	17 33	11 49	7 23	21 44	7 05
12	18 25	11 51	7 21	21 40	7 02
13	19 19	11 52	7 19	21 35	6 58

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.6	0.1	0.1
30			
	0.6	0.1	0.1
45			
	0.6	0.1	0.1
60			
	0.6	0.0	0.0
75			
	0.6	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	10	11	12
°	′	′	′
0			
	18.5	18.5	18.2
4			
	18.5	18.5	18.2
8			
	18.4	18.4	18.2
12			
	18.4	18.4	18.2
16			
	18.4	18.4	18.1
20			
	18.3	18.3	18.1
24			
	18.2	18.2	18.0
28			
	18.2	18.2	17.9
32			
	18.1	18.1	17.9
36			
	18.0	18.0	17.8
40			
	17.9	17.9	17.7
44			
	17.8	17.8	17.6
48			
	17.7	17.7	17.5
52			
	17.5	17.5	17.4
56			
	17.4	17.4	17.2
60			
	17.3	17.3	17.1
64			
	17.1	17.1	17.0
68			
	17.0	17.0	16.8
72			
	16.8	16.8	16.7
76			
	16.7	16.7	16.6
80			
	16.5	16.5	16.4
84			
	16.3	16.3	16.3
88			
	16.2	16.2	16.2
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	10	11	12
°	′	′	′
0			
	13.9	13.9	14.0
4			
	13.9	13.9	14.0
8			
	13.9	13.9	14.1
12			
	13.9	13.9	14.1
16			
	14.0	14.0	14.1
20			
	14.0	14.0	14.2
24			
	14.1	14.1	14.2
28			
	14.2	14.2	14.3
32			
	14.3	14.3	14.4
36			
	14.4	14.4	14.5
40			
	14.5	14.5	14.6
44			
	14.6	14.6	14.7
48			
	14.7	14.7	14.8
52			
	14.8	14.8	14.9
56			
	15.0	15.0	15.0
60			
	15.1	15.1	15.1
64			
	15.2	15.2	15.3
68			
	15.4	15.4	15.4
72			
	15.5	15.5	15.5
76			
	15.7	15.7	15.7
80			
	15.9	15.9	15.8
84			
	16.0	16.0	16.0
88			
	16.1	16.1	16.1
90			

Subtract from table, back cover

First Quarter 12

GMT	♈ GHA	VENUS −3.5 GHA	Dec.	MARS 1.4 GHA	Dec.	JUPITER −2.2 GHA	Dec.	SATURN 0.8 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
13 0	111 56.3	182 07.9	−22 50.9	250 01.3	−14 59.8	35 12.7	+22 27.1	255 14.0	−12 00.0	80 50.8	85	+18 08.4	+114
1	126 58.8	197 07.0	50.6	265 02.4	15 00.2	50 15.4	27.1	270 16.3	00.1	95 18.3	84	18 19.8	+112
2	142 01.2	212 06.1	50.2	280 03.4	00.7	65 18.1	27.1	285 18.6	00.1	109 45.7	83	18 31.0	+112
3	157 03.7	227 05.1	·· 49.9	295 04.4	·· 01.1	80 20.8	·· 27.1	300 21.0	·· 00.1	124 13.0	83	·18 42.2	+110
4	172 06.2	242 04.2	49.5	310 05.4	01.5	95 23.5	27.1	315 23.3	00.2	138 40.3	82	18 53.2	+110
5	187 08.6	257 03.3	49.2	325 06.4	02.0	110 26.2	27.1	330 25.6	00.2	153 07.5	81	19 04.2	+108
6	202 11.1	272 02.4	−22 48.9	340 07.4	−15 02.4	125 28.9	+22 27.1	345 27.9	−12 00.3	167 34.6	81	+19 15.0	+107
7	217 13.5	287 01.4	48.5	355 08.4	02.9	140 31.6	27.1	0 30.2	00.3	182 01.7	80	19 25.7	+105
8	232 16.0	302 00.5	48.2	10 09.5	03.3	155 34.3	27.0	15 32.6	00.3	196 28.7	79	19 36.2	+105
9	247 18.5	316 59.6	·· 47.8	25 10.5	·· 03.8	170 37.0	·· 27.0	30 34.9	·· 00.4	210 55.6	78	·19 46.7	+103
10	262 20.9	331 58.7	47.5	40 11.5	04.2	185 39.7	27.0	45 37.2	00.4	225 22.4	78	19 57.0	+103
11	277 23.4	346 57.7	47.1	55 12.5	04.7	200 42.4	27.0	60 39.5	00.5	239 49.2	78	20 07.3	+101
12	292 25.9	1 56.8	−22 46.8	70 13.5	−15 05.1	215 45.2	+22 27.0	75 41.8	−12 00.5	254 16.0	76	+20 17.4	+ 99
13	307 28.3	16 55.9	46.4	85 14.5	05.6	230 47.9	27.0	90 44.2	00.5	268 42.6	76	20 27.3	+ 99
14	322 30.8	31 55.0	46.1	100 15.6	06.0	245 50.6	27.0	105 46.5	00.6	283 09.2	75	20 37.2	+ 97
15	337 33.3	46 54.0	·· 45.7	115 16.6	·· 06.4	260 53.3	·· 27.0	120 48.8	·· 00.6	297 35.7	75	·20 46.9	+ 96
16	352 35.7	61 53.1	45.4	130 17.6	06.9	275 56.0	26.9	135 51.1	00.6	312 02.2	74	20 56.5	+ 95
17	7 38.2	76 52.2	45.0	145 18.6	07.3	290 58.7	26.9	150 53.4	00.7	326 28.6	73	21 06.0	+ 93
18	22 40.7	91 51.3	−22 44.7	160 19.6	−15 07.8	306 01.4	+22 26.9	165 55.8	−12 00.7	340 54.9	73	+21 15.3	+ 92
19	37 43.1	106 50.3	44.3	175 20.6	08.2	321 04.1	26.9	180 58.1	00.7	355 21.2	72	21 24.5	+ 91
20	52 45.6	121 49.4	43.9	190 21.6	08.7	336 06.8	26.9	196 00.4	00.8	9 47.4	71	21 33.6	+ 89
21	67 48.0	136 48.5	·· 43.6	205 22.7	·· 09.1	351 09.5	·· 26.9	211 02.7	·· 00.8	24 13.5	70	·21 42.5	+ 88
22	82 50.5	151 47.6	43.2	220 23.7	09.6	6 12.2	26.9	226 05.1	00.9	38 39.5	70	21 51.3	+ 87
23	97 53.0	166 46.6	42.9	235 24.7	10.0	21 14.9	26.9	241 07.4	00.9	53 05.5	70	22 00.0	+ 85
14 0	112 55.4	181 45.7	−22 42.5	250 25.7	−15 10.4	36 17.6	+22 26.8	256 09.7	−12 00.9	67 31.5	69	+22 08.5	+ 84
1	127 57.9	196 44.8	42.1	265 26.7	10.9	51 20.3	26.8	271 12.0	01.0	81 57.4	68	22 16.9	+ 83
2	143 00.4	211 43.9	41.8	280 27.7	11.3	66 23.0	26.8	286 14.3	01.0	96 23.2	67	22 25.2	+ 81
3	158 02.8	226 43.0	·· 41.4	295 28.7	·· 11.8	81 25.7	·· 26.8	301 16.7	·· 01.0	110 48.9	67	·22 33.3	+ 79
4	173 05.3	241 42.0	41.0	310 29.8	12.2	96 28.4	26.8	316 19.0	01.1	125 14.6	67	22 41.2	+ 79
5	188 07.8	256 41.1	40.6	325 30.8	12.7	111 31.1	26.8	331 21.3	01.1	139 40.3	65	22 49.1	+ 77
6	203 10.2	271 40.2	−22 40.3	340 31.8	−15 13.1	126 33.8	+22 26.8	346 23.6	−12 01.2	154 05.8	66	+22 56.8	+ 75
7	218 12.7	286 39.3	39.9	355 32.8	13.5	141 36.5	26.8	1 26.0	01.2	168 31.4	64	23 04.3	+ 74
8	233 15.1	301 38.4	39.5	10 33.8	14.0	156 39.2	26.7	16 28.3	01.2	182 56.8	64	23 11.7	+ 72
9	248 17.6	316 37.4	·· 39.2	25 34.8	·· 14.4	171 41.9	·· 26.7	31 30.6	·· 01.3	197 22.2	64	·23 18.9	+ 71
10	263 20.1	331 36.5	38.8	40 35.8	14.9	186 44.6	26.7	46 32.9	01.3	211 47.6	63	23 26.0	+ 70
11	278 22.5	346 35.6	38.4	55 36.9	15.3	201 47.3	26.7	61 35.3	01.3	226 12.9	62	23 33.0	+ 68
12	293 25.0	1 34.7	−22 38.0	70 37.9	−15 15.7	216 50.0	+22 26.7	76 37.6	−12 01.4	240 38.1	62	+23 39.8	+ 66
13	308 27.5	16 33.8	37.6	85 38.9	16.2	231 52.7	26.7	91 39.9	01.4	255 03.3	62	23 46.4	+ 65
14	323 29.9	31 32.8	37.3	100 39.9	16.6	246 55.4	26.7	106 42.2	01.4	269 28.5	61	23 52.9	+ 64
15	338 32.4	46 31.9	·· 36.9	115 40.9	·· 17.1	261 58.1	·· 26.7	121 44.6	·· 01.5	283 53.6	60	·23 59.3	+ 62
16	353 34.9	61 31.0	36.5	130 41.9	17.5	277 00.8	26.6	136 46.9	01.5	298 18.6	60	24 05.5	+ 60
17	8 37.3	76 30.1	36.1	145 42.9	17.9	292 03.5	26.6	151 49.2	01.6	312 43.6	60	24 11.5	+ 59
18	23 39.8	91 29.2	−22 35.7	160 44.0	−15 18.4	307 06.2	+22 26.6	166 51.5	−12 01.6	327 08.6	59	+24 17.4	+ 57
19	38 42.3	106 28.3	35.3	175 45.0	18.8	322 08.9	26.6	181 53.9	01.6	341 33.5	59	24 23.1	+ 56
20	53 44.7	121 27.3	34.9	190 46.0	19.3	337 11.6	26.6	196 56.2	01.7	355 58.4	58	24 28.7	+ 54
21	68 47.2	136 26.4	·· 34.6	205 47.0	·· 19.7	352 14.3	·· 26.6	211 58.5	·· 01.7	10 23.2	58	·24 34.1	+ 53
22	83 49.6	151 25.5	34.2	220 48.0	20.1	7 17.0	26.6	227 00.8	01.7	24 48.0	57	24 39.4	+ 51
23	98 52.1	166 24.6	33.8	235 49.0	20.6	22 19.7	26.6	242 03.2	01.8	39 12.7	58	24 44.5	+ 49
15 0	113 54.6	181 23.7	−22 33.4	250 50.0	−15 21.0	37 22.4	+22 26.5	257 05.5	−12 01.8	53 37.5	56	+24 49.4	+ 48
1	128 57.0	196 22.8	33.0	265 51.1	21.5	52 25.1	26.5	272 07.8	01.8	68 02.1	57	24 54.2	+ 46
2	143 59.5	211 21.9	32.6	280 52.1	21.9	67 27.8	26.5	287 10.1	01.9	82 26.8	56	24 58.8	+ 44
3	159 02.0	226 20.9	·· 32.2	295 53.1	·· 22.3	82 30.4	·· 26.5	302 12.5	·· 01.9	96 51.4	56	·25 03.2	+ 43
4	174 04.4	241 20.0	31.8	310 54.1	22.8	97 33.1	26.5	317 14.8	01.9	111 16.0	56	25 07.5	+ 42
5	189 06.9	256 19.1	31.4	325 55.1	23.2	112 35.8	26.5	332 17.1	02.0	125 40.6	55	25 11.7	+ 39
6	204 09.4	271 18.2	−22 31.0	340 56.1	−15 23.6	127 38.5	+22 26.5	347 19.4	−12 02.0	140 05.1	55	+25 15.6	+ 39
7	219 11.8	286 17.3	30.6	355 57.1	24.1	142 41.2	26.5	2 21.8	02.1	154 29.6	55	25 19.5	+ 36
8	234 14.3	301 16.4	30.2	10 58.2	24.5	157 43.9	26.5	17 24.1	02.1	168 54.1	54	25 23.1	+ 35
9	249 16.8	316 15.5	·· 29.8	25 59.2	·· 25.0	172 46.6	·· 26.4	32 26.4	·· 02.1	183 18.5	55	·25 26.6	+ 33
10	264 19.2	331 14.6	29.4	41 00.2	25.4	187 49.3	26.4	47 28.7	02.2	197 43.0	54	25 29.9	+ 31
11	279 21.7	346 13.7	29.0	56 01.2	25.8	202 52.0	26.4	62 31.1	02.2	212 07.4	54	25 33.0	+ 30
12	294 24.1	1 12.7	−22 28.6	71 02.2	−15 26.3	217 54.7	+22 26.4	77 33.4	−12 02.2	226 31.8	54	+25 36.0	+ 28
13	309 26.6	16 11.8	28.2	86 03.2	26.7	232 57.4	26.4	92 35.7	02.3	240 56.2	54	25 38.8	+ 27
14	324 29.1	31 10.9	27.8	101 04.2	27.1	248 00.1	26.4	107 38.1	02.3	255 20.6	54	25 41.5	+ 25
15	339 31.5	46 10.0	·· 27.3	116 05.3	·· 27.6	263 02.7	·· 26.4	122 40.4	·· 02.3	269 45.0	53	·25 44.0	+ 23
16	354 34.0	61 09.1	26.9	131 06.3	28.0	278 05.4	26.4	137 42.7	02.4	284 09.3	54	25 46.3	+ 22
17	9 36.5	76 08.2	26.5	146 07.3	28.4	293 08.1	26.4	152 45.0	02.4	298 33.7	53	25 48.5	+ 20
18	24 38.9	91 07.3	−22 26.1	161 08.3	−15 28.9	308 10.8	+22 26.3	167 47.4	−12 02.4	312 58.0	54	+25 50.5	+ 18
19	39 41.4	106 06.4	25.7	176 09.3	29.3	323 13.5	26.3	182 49.7	02.5	327 22.4	53	25 52.3	+ 16
20	54 43.9	121 05.5	25.3	191 10.3	29.8	338 16.2	26.3	197 52.0	02.5	341 46.7	54	25 53.9	+ 15
21	69 46.3	136 04.6	·· 24.9	206 11.3	·· 30.2	353 18.9	·· 26.3	212 54.4	·· 02.5	356 11.1	53	·25 55.4	+ 13
22	84 48.8	151 03.7	24.4	221 12.4	30.6	8 21.6	26.3	227 56.7	02.6	10 35.4	54	25 56.7	+ 12
23	99 51.3	166 02.8	24.0	236 13.4	31.1	23 24.3	26.3	242 59.0	02.6	24 59.8	54	25 57.9	+ 10
24	114 53.7	181 01.9	−22 23.6	251 14.4	−15 31.5	38 26.9	+22 26.3	258 01.4	−12 02.6	39 24.2	53	+25 58.9	+ 8
code	—	− 9	+ 4	+ 10	− 5	+ 27	0	+ 23	0				

GMT	SUN GHA	Dec.
h	° ′	° ′
13 0	177 52.8	−21 36.3
1	192 52.5	35.9
2	207 52.3	35.4
3	222 52.1	•• 35.0
4	237 51.8	34.6
5	252 51.6	34.2
6	267 51.3	−21 33.8
7	282 51.1	33.4
8	297 50.9	32.9
9	312 50.6	•• 32.5
10	327 50.4	32.1
11	342 50.2	31.7
12	357 49.9	−21 31.3
13	12 49.7	30.8
14	27 49.5	30.4
15	42 49.2	•• 30.0
16	57 49.0	29.6
17	72 48.8	29.2
18	87 48.5	−21 28.7
19	102 48.3	28.3
20	117 48.1	27.9
21	132 47.8	•• 27.4
22	147 47.6	27.0
23	162 47.4	26.6
14 0	177 47.1	−21 26.2
1	192 46.9	25.7
2	207 46.7	25.3
3	222 46.4	•• 24.9
4	237 46.2	24.4
5	252 46.0	24.0
6	267 45.7	−21 23.6
7	282 45.5	23.1
8	297 45.3	22.7
9	312 45.0	•• 22.3
10	327 44.8	21.8
11	342 44.6	21.4
12	357 44.4	−21 20.9
13	12 44.1	20.5
14	27 43.9	20.1
15	42 43.7	•• 19.6
16	57 43.5	19.2
17	72 43.2	18.7
18	87 43.0	−21 18.3
19	102 42.8	17.9
20	117 42.5	17.4
21	132 42.3	•• 17.0
22	147 42.1	16.5
23	162 41.9	16.1
15 0	177 41.6	−21 15.6
1	192 41.4	15.2
2	207 41.2	14.7
3	222 41.0	•• 14.3
4	237 40.7	13.8
5	252 40.5	13.4
6	267 40.3	−21 12.9
7	282 40.1	12.5
8	297 39.9	12.0
9	312 39.6	•• 11.6
10	327 39.4	11.1
11	342 39.2	10.7
12	357 39.0	−21 10.2
13	12 38.7	09.7
14	27 38.5	09.3
15	42 38.3	•• 08.8
16	57 38.1	08.4
17	72 37.9	07.9
18	87 37.6	−21 07.5
19	102 37.4	07.0
20	117 37.2	06.5
21	132 37.0	•• 06.1
22	147 36.8	05.6
23	162 36.5	05.1
24	177 36.3	−21 04.7
code	—	+ 4

STARS No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.9	−40 29.4
5	Achernar	335 59.6	−57 28.4
30	Acrux	173 59.2	−62 50.5
19	Adhara	255 47.2	−28 54.5
10	Aldebaran	291 40.3	+16 25.2
32	Alioth	166 59.4	+56 12.1
34	Alkaid	153 33.8	+49 32.1
55	Al Na'ir	28 39.8	−47 11.2
15	Alnilam	276 31.3	− 1 13.8
25	Alphard	218 39.5	− 8 27.6
41	Alphecca	126 48.9	+26 51.8
1	Alpheratz	358 29.8	+28 50.4
51	Altair	62 52.0	+ 8 44.7
2	Ankaa	353 59.6	−42 33.5
42	Antares	113 21.2	−26 19.9
37	Arcturus	146 36.4	+19 25.0
43	Atria	109 03.5	−68 56.7
22	Avior	234 35.7	−59 21.6
13	Bellatrix	279 19.5	+ 6 18.6
16	Betelg'se	271 49.2	+ 7 24.0
17	Canopus	264 15.4	−52 40.2
12	Capella	281 39.9	+45 57.4
53	Deneb	50 02.4	+45 07.0
28	Denebola	183 16.8	+14 49.5
4	Diphda	349 40.6	−18 14.4
27	Dubhe	194 45.5	+61 59.6
14	Elnath	279 08.6	+28 34.3
47	Eltanin	91 07.3	+51 29.4
54	Enif	34 31.1	+ 9 39.8
56	Fomalhaut	16 13.2	−29 52.1
31	Gacrux	172 50.6	−56 51.2
29	Gienah	176 38.1	−17 17.3
35	Hadar	149 51.4	−60 09.0
6	Hamal	328 51.0	+23 15.0
48	Kaus Aust.	84 43.2	−34 24.5
40	Kochab	137 18.1	+74 20.2
57	Markab	14 22.9	+14 57.6
8	Menkar	315 01.5	+ 3 54.7
36	Menkent	149 00.3	−36 08.7
24	Miapl'dus	221 48.6	−69 31.6
9	Mirfak	309 44.0	+49 42.3
50	Nunki	76 53.8	−26 21.4
52	Peacock	54 29.8	−56 53.1
21	Pollux	244 21.7	+28 08.3
20	Procyon	245 46.0	+ 5 20.6
46	R'alhague	96 48.1	+12 35.4
26	Regulus	208 30.6	+12 11.4
11	Rigel	281 54.6	− 8 15.2
38	Rigil Kent.	140 53.0	−60 38.7
44	Sabik	103 03.9	−15 40.3
3	Schedar	350 31.7	+56 17.5
45	Shaula	97 22.8	−37 04.3
18	Sirius	259 12.6	−16 39.1
33	Spica	159 18.2	−10 55.4
23	Suhail	223 24.9	−43 14.8
49	Vega	81 09.5	+38 44.3
39	Zub'g'bi	137 54.9	−15 51.2

Lat.	Sunrise	Twlt. begins	Moonrise 13	14	15	16
N °	h m	h m	h m	h m	h m	h m
72	■	6 39	□	□	□	□
70	■	6 33	7 50	□	□	□
68	10 40	6 29	8 49	□	□	□
66	9 57	6 24	9 23	8 55	□	□
64	9 29	6 20	9 48	9 45	9 44	10 12
62	9 07	6 16	10 08	10 17	10 38	11 27
60	8 50	6 13	10 24	10 41	11 10	12 03
58	8 35	6 10	10 38	11 00	11 35	12 29
56	8 23	6 07	10 50	11 16	11 54	12 50
54	8 12	6 04	11 01	11 30	12 11	13 07
52	8 02	6 00	11 10	11 42	12 25	13 21
50	7 54	5 58	11 19	11 53	12 37	13 34
45	7 36	5 51	11 37	12 15	13 03	14 00
40	7 21	5 45	11 51	12 33	13 23	14 21
35	7 08	5 39	12 04	12 48	13 40	14 38
30	6 57	5 33	12 15	13 02	13 55	14 53
20	6 38	5 20	12 34	13 24	14 20	15 19
10	6 21	5 07	12 50	13 44	14 41	15 40
0	6 05	4 51	13 06	14 03	15 02	16 01
10	5 49	4 33	13 22	14 22	15 22	16 21
20	5 32	4 09	13 39	14 42	15 44	16 43
30	5 12	3 37	13 58	15 05	16 09	17 09
35	5 01	3 17	14 10	15 19	16 24	17 23
40	4 47	2 49	14 23	15 35	16 42	17 41
45	4 31	2 10	14 39	15 54	17 03	18 02
50	4 11	0 49	14 58	16 18	17 29	18 28
52	4 02	////	15 07	16 29	17 42	18 41
54	3 51	////	15 18	16 42	17 57	18 55
56	3 39	////	15 30	16 58	18 14	19 12
58	3 25	////	15 43	17 16	18 35	19 32
60 S	3 08	////	16 00	17 38	19 01	19 58

Lat.	Sunset	Twlt. ends	Moonset 13	14	15	16
N °	h m	h m	h m	h m	h m	h m
72	■	17 39	□	□	□	□
70	■	17 46	5 35	□	□	□
68	13 39	17 51	4 38	□	□	□
66	14 21	17 55	4 04	6 30	□	□
64	14 50	18 00	3 40	5 40	7 44	9 20
62	15 11	18 03	3 21	5 09	6 50	8 04
60	15 29	18 07	3 06	4 46	6 18	7 29
58	15 43	18 09	2 52	4 27	5 54	7 03
56	15 56	18 13	2 41	4 12	5 34	6 42
54	16 06	18 15	2 31	3 58	5 18	6 25
52	16 16	18 18	2 23	3 47	5 04	6 10
50	16 25	18 21	2 15	3 36	4 52	5 58
45	16 43	18 27	1 58	3 15	4 27	5 31
40	16 58	18 34	1 45	2 57	4 07	5 11
35	17 10	18 39	1 33	2 43	3 50	4 53
30	17 21	18 45	1 23	2 30	3 36	4 38
20	17 40	18 58	1 06	2 09	3 12	4 13
10	17 57	19 11	0 51	1 50	2 50	3 51
0	18 13	19 27	0 37	1 33	2 31	3 30
10	18 28	19 44	0 24	1 16	2 11	3 10
20	18 45	20 07	0 09	0 57	1 50	2 47
30	19 05	20 38	24 36	0 36	1 26	2 22
35	19 17	21 00	24 24	0 24	1 12	2 07
40	19 30	21 26	24 09	0 09	0 55	1 49
45	19 46	22 05	23 53	24 35	0 35	1 28
50	20 06	23 23	23 32	24 11	0 11	1 02
52	20 15	////	23 22	23 59	24 49	0 49
54	20 26	////	23 12	23 46	24 34	0 34
56	20 38	////	22 59	23 30	24 16	0 16
58	20 52	////	22 45	23 12	23 55	25 00
60 S	21 09	////	22 28	22 49	23 29	24 35

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.6	0.1	0.1
30			
	0.6	0.1	0.1
45			
	0.6	0.1	0.1
60			
	0.6	0.0	0.0
75			
	0.6	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	13	14	15
°	′	′	′
0			
	18.0	17.7	17.2
4			
	18.0	17.7	17.2
8			
	17.9	17.7	17.2
12			
	17.9	17.7	17.2
16			
	17.9	17.6	17.1
20			
	17.8	17.6	17.1
24			
	17.8	17.5	17.1
28			
	17.7	17.5	17.0
32			
	17.6	17.4	17.0
36			
	17.6	17.4	16.9
40			
	17.5	17.3	16.9
44			
	17.4	17.2	16.8
48			
	17.3	17.1	16.7
52			
	17.2	17.0	16.7
56			
	17.1	16.9	16.6
60			
	17.0	16.8	16.5
64			
	16.8	16.7	16.4
68			
	16.7	16.6	16.4
72			
	16.6	16.5	16.3
76			
	16.5	16.4	16.2
80			
	16.3	16.3	16.1
84			
	16.2	16.1	16.0
88			
	16.1	16.0	15.9
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	13	14	15
°	′	′	′
0			
	14.2	14.3	14.6
4			
	14.2	14.3	14.6
8			
	14.2	14.3	14.6
12			
	14.2	14.4	14.6
16			
	14.3	14.4	14.7
20			
	14.3	14.4	14.7
24			
	14.4	14.5	14.7
28			
	14.4	14.5	14.8
32			
	14.5	14.6	14.8
36			
	14.6	14.7	14.9
40			
	14.7	14.8	14.9
44			
	14.7	14.8	15.0
48			
	14.8	14.9	15.1
52			
	15.0	15.0	15.1
56			
	15.1	15.1	15.2
60			
	15.2	15.2	15.3
64			
	15.3	15.3	15.4
68			
	15.4	15.4	15.5
72			
	15.5	15.5	15.5
76			
	15.7	15.7	15.6
80			
	15.8	15.8	15.7
84			
	15.9	15.9	15.8
88			
	16.0	16.0	15.9
90			

Subtract from table, back cover

Equation of Time (App.—Mean)

GMT	13	14	15
h	m s	m s	m s
0	− 8 28.5	− 8 51.1	− 9 13.0
6	− 8 34.2	− 8 56.6	− 9 18.4
12	− 8 39.8	− 9 02.1	− 9 23.7
18	− 8 45.5	− 9 07.6	− 9 29.0
24	− 8 51.1	− 9 13.0	− 9 34.2

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
13	19 19	11 52	7 19	21 35	6 58
14	20 17	11 54	7 18	21 31	6 54
15	21 16	11 55	7 16	21 27	6 51
16	22 15	11 57	7 15	21 22	6 47

GMT	♈ GHA	VENUS −3.5 GHA	VENUS Dec.	MARS 1.4 GHA	MARS Dec.	JUPITER −2.2 GHA	JUPITER Dec.	SATURN 0.8 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
16 0	114 53.7	181 01.9	−22 23.6	251 14.4	−15 31.5	38 26.9	+22 26.3	258 01.4	−12 02.6	39 24.2	53	+25 58.9	+ 8
1	129 56.2	196 00.9	23.2	266 15.4	31.9	53 29.6	26.3	273 03.7	02.7	53 48.5	54	25 59.7	+ 7
2	144 58.6	211 00.0	22.7	281 16.4	32.4	68 32.3	26.2	288 06.0	02.7	68 12.9	54	26 00.4	+ 4
3	160 01.1	225 59.1	·· 22.3	296 17.4	·· 32.8	83 35.0	·· 26.2	303 08.3	·· 02.7	82 37.3	54	·26 00.8	+ 4
4	175 03.6	240 58.2	21.9	311 18.4	33.2	98 37.7	26.2	318 10.7	02.8	97 01.7	54	26 01.2	+ 1
5	190 06.0	255 57.3	21.5	326 19.5	33.7	113 40.4	26.2	333 13.0	02.8	111 26.1	55	26 01.3	0
6	205 08.5	270 56.4	−22 21.0	341 20.5	−15 34.1	128 43.1	+22 26.2	348 15.3	−12 02.8	125 50.6	54	+26 01.3	− 2
7	220 11.0	285 55.5	20.6	356 21.5	34.5	143 45.7	26.2	3 17.7	02.9	140 15.0	55	26 01.1	− 3
8	235 13.4	300 54.6	20.2	11 22.5	35.0	158 48.4	26.2	18 20.0	02.9	154 39.5	55	26 00.8	− 5
9	250 15.9	315 53.7	·· 19.7	26 23.5	·· 35.4	173 51.1	·· 26.2	33 22.3	·· 02.9	169 04.0	56	·26 00.3	− 7
10	265 18.4	330 52.8	19.3	41 24.5	35.8	188 53.8	26.2	48 24.7	03.0	183 28.6	55	25 59.6	− 8
11	280 20.8	345 51.9	18.9	56 25.5	36.3	203 56.5	26.2	63 27.0	03.0	197 53.1	56	25 58.8	− 10
12	295 23.3	0 51.0	−22 18.4	71 26.6	−15 36.7	218 59.2	+22 26.1	78 29.3	−12 03.0	212 17.7	57	+25 57.8	− 12
13	310 25.7	15 50.1	18.0	86 27.6	37.1	234 01.8	26.1	93 31.6	03.1	226 42.4	56	25 56.6	− 13
14	325 28.2	30 49.2	17.6	101 28.6	37.6	249 04.5	26.1	108 34.0	03.1	241 07.0	57	25 55.3	− 15
15	340 30.7	45 48.3	·· 17.1	116 29.6	·· 38.0	264 07.2	·· 26.1	123 36.3	·· 03.2	255 31.7	57	·25 53.8	− 16
16	355 33.1	60 47.4	16.7	131 30.6	38.4	279 09.9	26.1	138 38.6	03.2	269 56.4	58	25 52.2	− 19
17	10 35.6	75 46.5	16.2	146 31.6	38.9	294 12.6	26.1	153 41.0	03.2	284 21.2	58	25 50.3	− 19
18	25 38.1	90 45.6	−22 15.8	161 32.6	−15 39.3	309 15.3	+22 26.1	168 43.3	−12 03.3	298 46.0	59	+25 48.4	− 22
19	40 40.5	105 44.7	15.4	176 33.7	39.7	324 17.9	26.1	183 45.6	03.3	313 10.9	59	25 46.2	− 22
20	55 43.0	120 43.8	14.9	191 34.7	40.1	339 20.6	26.1	198 48.0	03.3	327 35.8	59	25 44.0	− 25
21	70 45.5	135 42.9	·· 14.5	206 35.7	·· 40.6	354 23.3	·· 26.0	213 50.3	·· 03.4	342 00.7	60	·25 41.5	− 26
22	85 47.9	150 42.0	14.0	221 36.7	41.0	9 26.0	26.0	228 52.6	03.4	356 25.7	61	25 38.9	− 28
23	100 50.4	165 41.1	13.6	236 37.7	41.4	24 28.7	26.0	243 55.0	03.4	10 50.8	61	25 36.1	− 29
17 0	115 52.9	180 40.2	−22 13.1	251 38.7	−15 41.9	39 31.3	+22 26.0	258 57.3	−12 03.4	25 15.9	61	+25 33.2	− 31
1	130 55.3	195 39.3	12.7	266 39.7	42.3	54 34.0	26.0	273 59.6	03.5	39 41.0	62	25 30.1	− 32
2	145 57.8	210 38.4	12.2	281 40.8	42.7	69 36.7	26.0	289 02.0	03.5	54 06.2	63	25 26.9	− 34
3	161 00.2	225 37.5	·· 11.8	296 41.8	·· 43.2	84 39.4	·· 26.0	304 04.3	·· 03.5	68 31.5	63	·25 23.5	− 35
4	176 02.7	240 36.6	11.3	311 42.8	43.6	99 42.1	26.0	319 06.6	03.6	82 56.8	64	25 20.0	− 37
5	191 05.2	255 35.7	10.9	326 43.8	44.0	114 44.7	26.0	334 09.0	03.6	97 22.2	65	25 16.3	− 39
6	206 07.6	270 34.9	−22 10.4	341 44.8	−15 44.4	129 47.4	+22 25.9	349 11.3	−12 03.6	111 47.7	65	+25 12.4	− 40
7	221 10.1	285 34.0	09.9	356 45.8	44.9	144 50.1	25.9	4 13.6	03.7	126 13.2	65	25 08.4	− 41
8	236 12.6	300 33.1	09.5	11 46.8	45.3	159 52.8	25.9	19 16.0	03.7	140 38.7	67	25 04.3	− 43
9	251 15.0	315 32.2	·· 09.0	26 47.8	·· 45.7	174 55.4	·· 25.9	34 18.3	·· 03.7	155 04.4	67	·25 00.0	− 45
10	266 17.5	330 31.3	08.6	41 48.9	46.2	189 58.1	25.9	49 20.6	03.8	169 30.1	68	24 55.5	− 46
11	281 20.0	345 30.4	08.1	56 49.9	46.6	205 00.8	25.9	64 23.0	03.8	183 55.9	68	24 50.9	− 47
12	296 22.4	0 29.5	−22 07.6	71 50.9	−15 47.0	220 03.5	+22 25.9	79 25.3	−12 03.8	198 21.7	69	+24 46.2	− 49
13	311 24.9	15 28.6	07.2	86 51.9	47.4	235 06.1	25.9	94 27.7	03.9	212 47.6	70	24 41.3	− 50
14	326 27.4	30 27.7	06.7	101 52.9	47.9	250 08.8	25.9	109 30.0	03.9	227 13.6	71	24 36.3	− 52
15	341 29.8	45 26.8	·· 06.2	116 53.9	·· 48.3	265 11.5	·· 25.9	124 32.3	·· 03.9	241 39.7	71	·24 31.1	− 53
16	356 32.3	60 25.9	05.8	131 54.9	48.7	280 14.2	25.8	139 34.7	04.0	256 05.8	72	24 25.8	− 54
17	11 34.7	75 25.0	05.3	146 56.0	49.1	295 16.8	25.8	154 37.0	04.0	270 32.0	73	24 20.4	− 56
18	26 37.2	90 24.1	−22 04.8	161 57.0	−15 49.6	310 19.5	+22 25.8	169 39.3	−12 04.0	284 58.3	74	+24 14.8	− 58
19	41 39.7	105 23.3	04.3	176 58.0	50.0	325 22.2	25.8	184 41.7	04.1	299 24.7	74	24 09.0	− 58
20	56 42.1	120 22.4	03.9	191 59.0	50.4	340 24.9	25.8	199 44.0	04.1	313 51.1	76	24 03.2	− 60
21	71 44.6	135 21.5	·· 03.4	207 00.0	·· 50.9	355 27.5	·· 25.8	214 46.3	·· 04.1	328 17.7	76	·23 57.2	− 62
22	86 47.1	150 20.6	02.9	222 01.0	51.3	10 30.2	25.8	229 48.7	04.2	342 44.3	77	23 51.0	− 62
23	101 49.5	165 19.7	02.4	237 02.0	51.7	25 32.9	25.8	244 51.0	04.2	357 11.0	77	23 44.8	− 64
18 0	116 52.0	180 18.8	−22 02.0	252 03.1	−15 52.1	40 35.5	+22 25.8	259 53.4	−12 04.2	11 37.7	79	+23 38.4	− 66
1	131 54.5	195 17.9	01.5	267 04.1	52.6	55 38.2	25.8	274 55.7	04.3	26 04.6	79	23 31.8	− 66
2	146 56.9	210 17.0	01.0	282 05.1	53.0	70 40.9	25.7	289 58.0	04.3	40 31.5	81	23 25.2	− 68
3	161 59.4	225 16.2	·· 00.5	297 06.1	·· 53.4	85 43.6	·· 25.7	305 00.4	·· 04.3	54 58.6	81	·23 18.4	− 70
4	177 01.9	240 15.3	22 00.0	312 07.1	53.8	100 46.2	25.7	320 02.7	04.4	69 25.7	82	23 11.4	− 70
5	192 04.3	255 14.4	21 59.6	327 08.1	54.3	115 48.9	25.7	335 05.0	04.4	83 52.9	83	23 04.4	− 72
6	207 06.8	270 13.5	−21 59.1	342 09.1	−15 54.7	130 51.6	+22 25.7	350 07.4	−12 04.4	98 20.2	83	+22 57.2	− 73
7	222 09.2	285 12.6	58.6	357 10.1	55.1	145 54.2	25.7	5 09.7	04.4	112 47.5	85	22 49.9	− 74
8	237 11.7	300 11.7	58.1	12 11.2	55.5	160 56.9	25.7	20 12.1	04.5	127 15.0	86	22 42.5	− 75
9	252 14.2	315 10.8	·· 57.6	27 12.2	·· 56.0	175 59.6	·· 25.7	35 14.4	·· 04.5	141 42.6	86	·22 35.0	− 77
10	267 16.6	330 10.0	57.1	42 13.2	56.4	191 02.2	25.7	50 16.7	04.5	156 10.2	88	22 27.3	− 78
11	282 19.1	345 09.1	56.6	57 14.2	56.8	206 04.9	25.7	65 19.1	04.6	170 38.0	88	22 19.5	− 79
12	297 21.6	0 08.2	−21 56.1	72 15.2	−15 57.2	221 07.6	+22 25.6	80 21.4	−12 04.6	185 05.8	89	+22 11.6	− 80
13	312 24.0	15 07.3	55.7	87 16.2	57.6	236 10.2	25.6	95 23.8	04.6	199 33.7	90	22 03.6	− 81
14	327 26.5	30 06.4	55.2	102 17.2	58.1	251 12.9	25.6	110 26.1	04.7	214 01.7	91	21 55.5	− 82
15	342 29.0	45 05.5	·· 54.7	117 18.3	·· 58.5	266 15.6	·· 25.6	125 28.4	·· 04.7	228 29.8	92	·21 47.3	− 84
16	357 31.4	60 04.7	54.2	132 19.3	58.9	281 18.2	25.6	140 30.8	04.7	242 58.0	93	21 38.9	− 84
17	12 33.9	75 03.8	53.7	147 20.3	59.3	296 20.9	25.6	155 33.1	04.8	257 26.3	94	21 30.5	− 86
18	27 36.4	90 02.9	−21 53.2	162 21.3	−15 59.8	311 23.6	+22 25.6	170 35.5	−12 04.8	271 54.7	95	+21 21.9	− 87
19	42 38.8	105 02.0	52.7	177 22.3	16 00.2	326 26.2	25.6	185 37.8	04.8	286 23.2	96	21 13.2	− 87
20	57 41.3	120 01.1	52.2	192 23.3	00.6	341 28.9	25.6	200 40.1	04.8	300 51.8	96	21 04.5	− 89
21	72 43.7	135 00.3	·· 51.7	207 24.3	·· 01.0	356 31.6	·· 25.6	215 42.5	·· 04.9	315 20.4	98	·20 55.6	− 90
22	87 46.2	149 59.4	51.2	222 25.3	01.4	11 34.2	25.5	230 44.8	04.9	329 49.2	98	20 46.6	− 91
23	102 48.7	164 58.5	50.7	237 26.4	01.9	26 36.9	25.5	245 47.2	04.9	344 18.0	100	20 37.5	− 92
24	117 51.1	179 57.6	−21 50.2	252 27.4	−16 02.3	41 39.6	+22 25.5	260 49.5	−12 05.0	358 47.0	100	+20 28.3	− 93
code	—	− 9	+ 4	+ 10	− 4	+ 26	0	+ 24	− 1				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
16 0	177 36.3	−21 04.7
1	192 36.1	04.2
2	207 35.9	03.8
3	222 35.7	•• 03.3
4	237 35.5	02.8
5	252 35.2	02.4
6	267 35.0	−21 01.9
7	282 34.8	01.4
8	297 34.6	01.0
9	312 34.4	•• 00.5
10	327 34.2	21 00.0
11	342 34.0	20 59.5
12	357 33.7	−20 59.1
13	12 33.5	58.6
14	27 33.3	58.1
15	42 33.1	•• 57.6
16	57 32.9	57.2
17	72 32.7	56.7
18	87 32.5	−20 56.2
19	102 32.2	55.7
20	117 32.0	55.3
21	132 31.8	•• 54.8
22	147 31.6	54.3
23	162 31.4	53.8
17 0	177 31.2	−20 53.3
1	192 31.0	52.9
2	207 30.8	52.4
3	222 30.6	•• 51.9
4	237 30.4	51.4
5	252 30.1	50.9
6	267 29.9	−20 50.4
7	282 29.7	50.0
8	297 29.5	49.5
9	312 29.3	•• 49.0
10	327 29.1	48.5
11	342 28.9	48.0
12	357 28.7	−20 47.5
13	12 28.5	47.0
14	27 28.3	46.5
15	42 28.1	•• 46.1
16	57 27.9	45.6
17	72 27.7	45.1
18	87 27.5	−20 44.6
19	102 27.2	44.1
20	117 27.0	43.6
21	132 26.8	•• 43.1
22	147 26.6	42.6
23	162 26.4	42.1
18 0	177 26.2	−20 41.6
1	192 26.0	41.1
2	207 25.8	40.6
3	222 25.6	•• 40.1
4	237 25.4	39.6
5	252 25.2	39.1
6	267 25.0	−20 38.6
7	282 24.8	38.1
8	297 24.6	37.6
9	312 24.4	•• 37.1
10	327 24.2	36.6
11	342 24.0	36.1
12	357 23.8	−20 35.6
13	12 23.6	35.1
14	27 23.4	34.6
15	42 23.2	•• 34.1
16	57 23.0	33.6
17	72 22.8	33.1
18	87 22.6	−20 32.5
19	102 22.4	32.0
20	117 22.2	31.5
21	132 22.0	•• 31.0
22	147 21.8	30.5
23	162 21.6	30.0
24	177 21.4	−20 29.5
code	—	+ 5

STARS

No.	Name	SHA ° ′	Dec. ° ′
7	Acamar	315 51.9	−40 29.4
5	Achernar	335 59.7	−57 28.4
30	Acrux	173 59.1	−62 50.5
19	Adhara	255 47.2	−28 54.6
10	Aldebaran	291 40.3	+16 25.2
32	Alioth	166 59.4	+56 12.1
34	Alkaid	153 33.8	+49 32.1
55	Al Na'ir	28 39.8	−47 11.2
15	Alnilam	276 31.3	− 1 13.8
25	Alphard	218 39.5	− 8 27.6
41	Alphecca	126 48.8	+26 51.8
1	Alpheratz	358 29.8	+28 50.4
51	Altair	62 52.0	+ 8 44.7
2	Ankaa	353 59.6	−42 33.5
42	Antares	113 21.2	−26 19.9
37	Arcturus	146 36.3	+19 25.0
43	Atria	109 03.5	−68 56.7
22	Avior	234 35.7	−59 21.7
13	Bellatrix	279 19.5	+ 6 18.6
16	Betelg'se	271 49.2	+ 7 24.0
17	Canopus	264 15.4	−52 40.3
12	Capella	281 39.9	+45 57.4
53	Deneb	50 02.4	+45 07.0
28	Denebola	183 18.8	+14 49.5
4	Diphda	349 40.6	−18 14.4
27	Dubhe	194 45.5	+61 59.6
14	Elnath	279 08.6	+28 34.3
47	Eltanin	91 07.3	+51 29.4
54	Enif	34 31.1	+ 9 39.8
56	Fomalhaut	16 13.2	−29 52.1
31	Gacrux	172 50.6	−56 51.2
29	Gienah	176 38.1	−17 17.3
35	Hadar	149 51.4	−60 09.0
6	Hamal	328 51.1	+23 15.0
48	Kaus Aust.	84 43.2	−34 24.5
40	Kochab	137 18.0	+74 20.2
57	Markab	14 22.9	+14 57.6
8	Menkar	315 01.5	+ 3 54.7
36	Menkent	149 00.2	−36 08.7
24	Miapl'dus	221 48.6	−69 31.6
9	Mirfak	309 44.0	+49 42.3
50	Nunki	76 53.8	−26 21.4
52	Peacock	54 29.8	−56 53.1
21	Pollux	244 21.7	+28 08.3
20	Procyon	245 46.0	+ 5 20.6
46	R'alhague	96 48.1	+12 35.4
26	Regulus	208 30.6	+12 11.4
11	Rigel	281 54.6	− 8 15.2
38	Rigil Kent.	140 53.0	−60 38.7
44	Sabik	103 03.9	−15 40.3
3	Schedar	350 31.7	+56 17.5
45	Shaula	97 22.7	−37 04.3
18	Sirius	259 12.6	−16 39.1
33	Spica	159 18.2	−10 55.4
23	Suhail	223 24.9	−43 14.8
49	Vega	81 09.5	+38 44.2
39	Zub'g'bi	137 54.9	−15 51.2

Lat.	Sunrise	Twlt. begins	Moonrise 16	Moonrise 17	Moonrise 18	Moonrise 19
N °	h m	h m	h m	h m	h m	h m
72	■	6 33	□	□	□	□
70	11 51	6 28	□	□	□	14 22
68	10 26	6 25	□	□	□	15 04
66	9 48	6 20	□	□	13 25	15 32
64	9 22	6 17	10 12	12 07	14 04	15 53
62	9 02	6 14	11 27	12 51	14 31	16 11
60	8 45	6 10	12 03	13 21	14 52	16 25
58	8 31	6 07	12 29	13 43	15 09	16 37
56	8 20	6 05	12 50	14 02	15 23	16 47
54	8 09	6 02	13 07	14 17	15 35	16 56
52	8 00	5 59	13 21	14 30	15 46	17 04
50	7 52	5 56	13 34	14 42	15 56	17 12
45	7 34	5 51	14 00	15 06	16 16	17 27
40	7 20	5 45	14 21	15 25	16 33	17 40
35	7 07	5 39	14 38	15 41	16 46	17 50
30	6 57	5 33	14 53	15 55	16 58	18 00
20	6 38	5 21	15 19	16 19	17 19	18 16
10	6 22	5 07	15 40	16 39	17 36	18 30
0	6 06	4 52	16 01	16 58	17 53	18 43
10	5 51	4 34	16 21	17 17	18 09	18 56
20	5 34	4 12	16 43	17 38	18 26	19 10
30	5 15	3 41	17 09	18 01	18 46	19 26
35	5 03	3 20	17 23	18 15	18 58	19 35
40	4 50	2 54	17 41	18 31	19 12	19 45
45	4 35	2 17	18 02	18 50	19 27	19 57
50	4 16	1 05	18 28	19 13	19 47	20 12
52	4 06	////	18 41	19 24	19 56	20 19
54	3 56	////	18 55	19 37	20 06	20 26
56	3 44	////	19 12	19 52	20 17	20 35
58	3 31	////	19 32	20 09	20 31	20 44
60 S	3 15	////	19 58	20 29	20 46	20 55

Lat.	Sunset	Twlt. ends	Moonset 16	Moonset 17	Moonset 18	Moonset 19
N °	h m	h m	h m	h m	h m	h m
72	■	17 48	□	□	□	□
70	12 29	17 53	□	□	□	10 57
68	13 55	17 57	□	□	□	10 13
66	14 33	18 02	□	□	10 04	9 44
64	14 59	18 05	9 20	9 27	9 25	9 22
62	15 19	18 08	8 04	8 42	8 57	9 04
60	15 35	18 11	7 29	8 12	8 36	8 49
58	15 49	18 14	7 03	7 49	8 18	8 36
56	16 01	18 17	6 42	7 31	8 03	8 25
54	16 11	18 19	6 25	7 15	7 50	8 15
52	16 21	18 22	6 10	7 02	7 39	8 06
50	16 29	18 25	5 58	6 50	7 29	7 58
45	16 47	18 31	5 31	6 25	7 08	7 42
40	17 01	18 36	5 11	6 05	6 51	7 28
35	17 13	18 42	4 53	5 49	6 36	7 16
30	17 24	18 48	4 38	5 34	6 23	7 06
20	17 42	18 59	4 13	5 10	6 02	6 48
10	17 58	19 12	3 51	4 49	5 43	6 32
0	18 14	19 28	3 30	4 29	5 25	6 17
10	18 29	19 45	3 10	4 09	5 07	6 02
20	18 45	20 07	2 47	3 47	4 48	5 46
30	19 05	20 38	2 22	3 23	4 25	5 28
35	19 16	20 58	2 07	3 08	4 12	5 17
40	19 29	21 24	1 49	2 51	3 57	5 05
45	19 44	22 00	1 28	2 30	3 39	4 50
50	20 03	23 08	1 02	2 05	3 16	4 32
52	20 12	////	0 49	1 52	3 05	4 23
54	20 23	////	0 34	1 38	2 53	4 14
56	20 34	////	0 16	1 21	2 39	4 03
58	20 47	////	25 00	1 00	2 22	3 50
60 S	21 03	////	24 35	0 35	2 02	3 36

Equation of Time (App.—Mean)

GMT	16	17	18
h	m s	m s	m s
0	− 9 34.2	− 9 54.8	−10 14.7
6	− 9 39.5	− 9 59.8	−10 19.5
12	− 9 44.6	−10 04.8	−10 24.3
18	− 9 49.7	−10 09.8	−10 29.1
24	− 9 54.8	−10 14.7	−10 33.8

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
16	22 15	11 57	7 15	21 22	6 47
17	23 12	11 58	7 13	21 18	6 43
18	24 05	12 00	7 11	21 14	6 39
19	0 05	12 01	7 10	21 10	6 36

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.6	0.1	0.1
30	0.6	0.1	0.1
45	0.6	0.1	0.1
60	0.6	0.0	0.0
75	0.6	0.0	0.0
90	0.6	0.0	0.0

Moon's Lower Limb Add

Alt.	16	17	18
°	′	′	′
0	16.8	16.2	15.6
4	16.8	16.2	15.6
8	16.8	16.2	15.6
12	16.8	16.2	15.6
16	16.8	16.2	15.6
20	16.8	16.2	15.6
24	16.7	16.1	15.6
28	16.7	16.1	15.6
32	16.7	16.1	15.6
36	16.6	16.1	15.6
40	16.6	16.1	15.6
44	16.5	16.0	15.6
48	16.5	16.0	15.6
52	16.4	16.0	15.6
56	16.4	16.0	15.6
60	16.3	15.9	15.6
64	16.2	15.9	15.6
68	16.2	15.9	15.6
72	16.1	15.8	15.6
76	16.0	15.8	15.6
80	16.0	15.8	15.6
84	15.9	15.7	15.6
88	15.8	15.7	15.6
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	16	17	18
°	′	′	′
0	14.8	15.2	15.6
4	14.8	15.2	15.6
8	14.8	15.2	15.6
12	14.9	15.2	15.6
16	14.9	15.2	15.6
20	14.9	15.2	15.6
24	14.9	15.2	15.6
28	15.0	15.3	15.6
32	15.0	15.3	15.6
36	15.0	15.3	15.6
40	15.1	15.3	15.6
44	15.1	15.3	15.6
48	15.2	15.4	15.6
52	15.2	15.4	15.6
56	15.3	15.4	15.6
60	15.4	15.5	15.6
64	15.4	15.5	15.6
68	15.5	15.5	15.6
72	15.5	15.5	15.6
76	15.6	15.6	15.6
80	15.7	15.6	15.6
84	15.8	15.7	15.6
88	15.8	15.7	15.6
90			

Subtract from table, back cover

GMT		♈ GHA	VENUS −3.5 GHA	VENUS Dec.	MARS 1.4 GHA	MARS Dec.	JUPITER −2.2 GHA	JUPITER Dec.	SATURN 0.8 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
19	0	117 51.1	179 57.6	−21 50.2	252 27.4	−16 02.3	41 39.6	+22 25.5	260 49.5	−12 05.0	358 47.0	100	+20 28.3	−93
	1	132 53.6	194 56.8	49.7	267 28.4	02.7	56 42.2	25.5	275 51.8	05.0	13 16.0	102	20 19.0	−94
	2	147 56.1	209 55.9	49.1	282 29.4	03.1	71 44.9	25.5	290 54.2	05.0	27 45.2	102	20 09.6	−95
	3	162 58.5	224 55.0	·· 48.6	297 30.4	·· 03.6	86 47.5	·· 25.5	305 56.5	·· 05.1	42 14.4	103	·20 00.1	−95
	4	178 01.0	239 54.1	48.1	312 31.4	04.0	101 50.2	25.5	320 58.9	05.1	56 43.7	105	19 50.6	−97
	5	193 03.5	254 53.2	47.6	327 32.4	04.4	116 52.9	25.5	336 01.2	05.1	71 13.2	105	19 40.9	−98
	6	208 05.9	269 52.4	−21 47.1	342 33.4	−16 04.8	131 55.5	+22 25.5	351 03.5	−12 05.1	85 42.7	106	+19 31.1	−98
	7	223 08.4	284 51.5	46.6	357 34.5	05.2	146 58.2	25.5	6 05.9	05.2	100 12.3	107	19 21.3	−100
	8	238 10.8	299 50.6	46.1	12 35.5	05.7	162 00.8	25.5	21 08.2	05.2	114 42.0	108	19 11.3	−100
	9	253 13.3	314 49.8	·· 45.6	27 36.5	·· 06.1	177 03.5	·· 25.4	36 10.6	·· 05.2	129 11.8	109	·19 01.3	−101
	10	268 15.8	329 48.9	45.0	42 37.5	06.5	192 06.2	25.4	51 12.9	05.3	143 41.7	109	18 51.2	−103
	11	283 18.2	344 48.0	44.5	57 38.5	06.9	207 08.8	25.4	66 15.3	05.3	158 11.6	111	18 40.9	−102
	12	298 20.7	359 47.1	−21 44.0	72 39.5	−16 07.3	222 11.5	+22 25.4	81 17.6	−12 05.3	172 41.7	112	+18 30.7	−104
	13	313 23.2	14 46.3	43.5	87 40.5	07.7	237 14.1	25.4	96 19.9	05.4	187 11.9	112	18 20.3	−105
	14	328 25.6	29 45.4	43.0	102 41.6	08.2	252 16.8	25.4	111 22.3	05.4	201 42.1	114	18 09.8	−105
	15	343 28.1	44 44.5	·· 42.4	117 42.6	·· 08.6	267 19.5	·· 25.4	126 24.6	·· 05.4	216 12.5	114	·17 59.3	−106
	16	358 30.6	59 43.6	41.9	132 43.6	09.0	282 22.1	25.4	141 27.0	05.4	230 42.9	115	17 48.7	−107
	17	13 33.0	74 42.8	41.4	147 44.6	09.4	297 24.8	25.4	156 29.3	05.5	245 13.4	117	17 38.0	−108
	18	28 35.5	89 41.9	−21 40.9	162 45.6	−16 09.8	312 27.4	+22 25.4	171 31.7	−12 05.5	259 44.1	117	+17 27.2	−108
	19	43 38.0	104 41.0	40.3	177 46.6	10.3	327 30.1	25.4	186 34.0	05.5	274 14.8	118	17 16.4	−110
	20	58 40.4	119 40.2	39.8	192 47.6	10.7	342 32.8	25.3	201 36.3	05.6	288 45.6	119	17 05.4	−109
	21	73 42.9	134 39.3	·· 39.3	207 48.6	·· 11.1	357 35.4	·· 25.3	216 38.7	·· 05.6	303 16.5	119	·16 54.5	−111
	22	88 45.3	149 38.4	38.7	222 49.7	11.5	12 38.1	25.3	231 41.0	05.6	317 47.4	121	16 43.4	−111
	23	103 47.8	164 37.6	38.2	237 50.7	11.9	27 40.7	25.3	246 43.4	05.7	332 18.5	121	16 32.3	−112
20	0	118 50.3	179 36.7	−21 37.7	252 51.7	−16 12.3	42 43.4	+22 25.3	261 45.7	−12 05.7	346 49.6	123	+16 21.1	−113
	1	133 52.7	194 35.8	37.1	267 52.7	12.8	57 46.0	25.3	276 48.1	05.7	1 20.9	123	16 09.8	−113
	2	148 55.2	209 35.0	36.6	282 53.7	13.2	72 48.7	25.3	291 50.4	05.7	15 52.2	124	15 58.5	−114
	3	163 57.7	224 34.1	·· 36.1	297 54.7	·· 13.6	87 51.3	·· 25.3	306 52.8	·· 05.8	30 23.6	125	·15 47.1	−115
	4	179 00.1	239 33.2	35.5	312 55.7	14.0	102 54.0	25.3	321 55.1	05.8	44 55.1	126	15 35.6	−115
	5	194 02.6	254 32.4	35.0	327 56.8	14.4	117 56.6	25.3	336 57.4	05.8	59 26.7	127	15 24.1	−116
	6	209 05.1	269 31.5	−21 34.5	342 57.8	−16 14.8	132 59.3	+22 25.3	351 59.8	−12 05.9	73 58.4	127	+15 12.5	−116
	7	224 07.5	284 30.6	33.9	357 58.8	15.3	148 02.0	25.2	7 02.1	05.9	88 30.1	128	15 00.9	−117
	8	239 10.0	299 29.8	33.4	12 59.8	15.7	163 04.6	25.2	22 04.5	05.9	103 01.9	129	14 49.2	−118
	9	254 12.5	314 28.9	·· 32.8	28 00.8	·· 16.1	178 07.3	·· 25.2	37 06.8	·· 05.9	117 33.8	130	·14 37.4	−118
	10	269 14.9	329 28.0	32.3	43 01.8	16.5	193 09.9	25.2	52 09.2	06.0	132 05.8	131	14 25.6	−119
	11	284 17.4	344 27.2	31.7	58 02.8	16.9	208 12.6	25.2	67 11.5	06.0	146 37.9	132	14 13.7	−119
	12	299 19.8	359 26.3	−21 31.2	73 03.8	−16 17.3	223 15.2	+22 25.2	82 13.9	−12 06.0	161 10.1	132	+14 01.8	−120
	13	314 22.3	14 25.4	30.7	88 04.9	17.7	238 17.9	25.2	97 16.2	06.1	175 42.3	133	13 49.8	−120
	14	329 24.8	29 24.6	30.1	103 05.9	18.2	253 20.5	25.2	112 18.6	06.1	190 14.6	134	13 37.8	−121
	15	344 27.2	44 23.7	·· 29.6	118 06.9	·· 18.6	268 23.2	·· 25.2	127 20.9	·· 06.1	204 47.0	135	·13 25.7	−121
	16	359 29.7	59 22.9	29.0	133 07.9	19.0	283 25.8	25.2	142 23.3	06.1	219 19.5	135	13 13.6	−122
	17	14 32.2	74 22.0	28.5	148 08.9	19.4	298 28.5	25.2	157 25.6	06.2	233 52.0	136	13 01.4	−122
	18	29 34.6	89 21.1	−21 27.9	163 09.9	−16 19.8	313 31.1	+22 25.2	172 28.0	−12 06.2	248 24.6	137	+12 49.2	−123
	19	44 37.1	104 20.3	27.3	178 10.9	20.2	328 33.8	25.1	187 30.3	06.2	262 57.3	138	12 36.9	−123
	20	59 39.6	119 19.4	26.8	193 11.9	20.6	343 36.4	25.1	202 32.6	06.2	277 30.1	138	12 24.6	−123
	21	74 42.0	134 18.6	·· 26.2	208 13.0	·· 21.0	358 39.1	·· 25.1	217 35.0	·· 06.3	292 02.9	139	·12 12.3	−124
	22	89 44.5	149 17.7	25.7	223 14.0	21.5	13 41.7	25.1	232 37.3	06.3	306 35.8	140	11 59.9	−124
	23	104 47.0	164 16.8	25.1	238 15.0	21.9	28 44.4	25.1	247 39.7	06.3	321 08.8	140	11 47.5	−125
21	0	119 49.4	179 16.0	−21 24.6	253 16.0	−16 22.3	43 47.0	+22 25.1	262 42.0	−12 06.4	335 41.8	141	+11 35.0	−125
	1	134 51.9	194 15.1	24.0	268 17.0	22.7	58 49.6	25.1	277 44.4	06.4	350 14.9	142	11 22.5	−126
	2	149 54.3	209 14.3	23.4	283 18.0	23.1	73 52.3	25.1	292 46.7	06.4	4 48.1	143	11 09.9	−126
	3	164 56.8	224 13.4	·· 22.9	298 19.0	·· 23.5	88 54.9	·· 25.1	307 49.1	·· 06.4	19 21.4	143	·10 57.3	−126
	4	179 59.3	239 12.6	22.3	313 20.0	23.9	103 57.6	25.1	322 51.4	06.5	33 54.7	143	10 44.7	−126
	5	195 01.7	254 11.7	21.7	328 21.1	24.3	119 00.2	25.1	337 53.8	06.5	48 28.0	145	10 32.1	−127
	6	210 04.2	269 10.9	−21 21.2	343 22.1	−16 24.8	134 02.9	+22 25.1	352 56.1	−12 06.5	63 01.5	145	+10 19.4	−128
	7	225 06.7	284 10.0	20.6	358 23.1	25.2	149 05.5	25.0	7 58.5	06.6	77 35.0	146	10 06.6	−127
	8	240 09.1	299 09.1	20.0	13 24.1	25.6	164 08.2	25.0	23 00.8	06.6	92 08.6	146	9 53.9	−128
	9	255 11.6	314 08.3	·· 19.5	28 25.1	·· 26.0	179 10.8	·· 25.0	38 03.2	·· 06.6	106 42.2	147	· 9 41.1	−128
	10	270 14.1	329 07.4	18.9	43 26.1	26.4	194 13.5	25.0	53 05.5	06.6	121 15.9	148	9 28.3	−128
	11	285 16.5	344 06.6	18.3	58 27.1	26.8	209 16.1	25.0	68 07.9	06.7	135 49.7	148	9 15.5	−129
	12	300 19.0	359 05.7	−21 17.8	73 28.2	−16 27.2	224 18.7	+22 25.0	83 10.2	−12 06.7	150 23.5	148	+ 9 02.6	−129
	13	315 21.4	14 04.9	17.2	88 29.2	27.6	239 21.4	25.0	98 12.6	06.7	164 57.3	150	8 49.7	−129
	14	330 23.9	29 04.0	16.6	103 30.2	28.0	254 24.0	25.0	113 14.9	06.7	179 31.3	150	8 36.8	−130
	15	345 26.4	44 03.2	·· 16.0	118 31.2	·· 28.4	269 26.7	·· 25.0	128 17.3	·· 06.8	194 05.3	150	· 8 23.8	−129
	16	0 28.8	59 02.3	15.5	133 32.2	28.9	284 29.3	25.0	143 19.6	06.8	208 39.3	151	8 10.9	−130
	17	15 31.3	74 01.5	14.9	148 33.2	29.3	299 31.9	25.0	158 22.0	06.8	223 13.4	151	7 57.9	−130
	18	30 33.8	89 00.6	−21 14.3	163 34.2	−16 29.7	314 34.6	+22 25.0	173 24.3	−12 06.8	237 47.5	152	+ 7 44.9	−131
	19	45 36.2	103 59.8	13.7	178 35.2	30.1	329 37.2	25.0	188 26.7	06.9	252 21.7	153	7 31.8	−130
	20	60 38.7	118 58.9	13.1	193 36.3	30.5	344 39.9	24.9	203 29.0	06.9	266 56.0	153	7 18.8	−131
	21	75 41.2	133 58.1	·· 12.5	208 37.3	·· 30.9	359 42.5	·· 24.9	218 31.4	·· 06.9	281 30.3	153	· 7 05.7	−131
	22	90 43.6	148 57.2	12.0	223 38.3	31.3	14 45.1	24.9	233 33.7	07.0	296 04.6	154	6 52.6	−131
	23	105 46.1	163 56.4	11.4	238 39.3	31.7	29 47.8	24.9	248 36.1	07.0	310 39.0	155	6 39.5	−131
	24	120 48.6	178 55.5	−21 10.8	253 40.3	−16 32.1	44 50.4	+22 24.9	263 38.4	−12 07.0	325 13.5	155	+ 6 26.4	−131
code		–	− 9	+ 5	+ 11	− 4	+ 27	[illegible]	+ 23	− 1				

GMT		SUN GHA	SUN Dec.
h		° ′	° ′
19	0	177 21.4	−20 29.5
	1	192 21.3	29.0
	2	207 21.1	28.4
	3	222 20.9 ••	27.9
	4	237 20.7	27.4
	5	252 20.5	26.9
	6	267 20.3	−20 26.4
	7	282 20.1	25.9
	8	297 19.9	25.3
	9	312 19.7 ••	24.8
	10	327 19.5	24.3
	11	342 19.3	23.8
	12	357 19.1	−20 23.3
	13	12 18.9	22.7
	14	27 18.7	22.2
	15	42 18.5 ••	21.7
	16	57 18.4	21.2
	17	72 18.2	20.6
	18	87 18.0	−20 20.1
	19	102 17.8	19.6
	20	117 17.6	19.1
	21	132 17.4 ••	18.5
	22	147 17.2	18.0
	23	162 17.0	17.5
20	0	177 16.8	−20 17.0
	1	192 16.7	16.4
	2	207 16.5	15.9
	3	222 16.3 ••	15.4
	4	237 16.1	14.8
	5	252 15.9	14.3
	6	267 15.7	−20 13.8
	7	282 15.5	13.2
	8	297 15.4	12.7
	9	312 15.2 ••	12.2
	10	327 15.0	11.6
	11	342 14.8	11.1
	12	357 14.6	−20 10.6
	13	12 14.4	10.0
	14	27 14.2	09.5
	15	42 14.1 ••	08.9
	16	57 13.9	08.4
	17	72 13.7	07.9
	18	87 13.5	−20 07.3
	19	102 13.3	06.8
	20	117 13.1	06.2
	21	132 13.0 ••	05.7
	22	147 12.8	05.1
	23	162 12.6	04.6
21	0	177 12.4	−20 04.1
	1	192 12.2	03.5
	2	207 12.1	03.0
	3	222 11.9 ••	02.4
	4	237 11.7	01.9
	5	252 11.5	01.3
	6	267 11.4	−20 00.8
	7	282 11.2	20 00.2
	8	297 11.0	19 59.7
	9	312 10.8 ••	59.1
	10	327 10.6	58.6
	11	342 10.5	58.0
	12	357 10.3	−19 57.5
	13	12 10.1	56.9
	14	27 09.9	56.4
	15	42 09.8 ••	55.8
	16	57 09.6	55.3
	17	72 09.4	54.7
	18	87 09.2	−19 54.1
	19	102 09.1	53.6
	20	117 08.9	53.0
	21	132 08.7 ••	52.5
	22	147 08.5	51.9
	23	162 08.4	51.3
	24	177 08.2	−19 50.8
code		—	+ 6

No.	STARS Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.9	−40 29.4
5	Achernar	335 59.7	−57 28.4
30	Acrux	173 59.1	−62 50.6
19	Adhara	255 47.2	−28 54.6
10	Aldebaran	291 40.3	+16 25.2
32	Alioth	166 59.3	+56 12.1
34	Alkaid	153 33.8	+49 32.1
55	Al Na'ir	28 39.9	−47 11.2
15	Alnilam	276 31.3	− 1 13.8
25	Alphard	218 39.5	− 8 27.6
41	Alphecca	126 48.8	+26 51.8
1	Alpheratz	358 29.8	+28 50.4
51	Altair	62 52.0	+ 8 44.7
2	Ankaa	353 59.6	−42 33.5
42	Antares	113 21.1	−26 19.9
37	Arcturus	146 36.3	+19 25.0
43	Atria	109 03.4	−68 56.7
22	Avior	234 35.7	−59 21.7
13	Bellatrix	279 19.5	+ 6 18.6
16	Betelg'se	271 49.2	+ 7 24.0
17	Canopus	264 15.4	−52 40.3
12	Capella	281 39.9	+45 57.4
53	Deneb	50 02.4	+45 07.0
28	Denebola	183 18.8	+14 49.5
4	Diphda	349 40.6	−18 14.4
27	Dubhe	194 45.5	+61 59.6
14	Elnath	279 08.6	+28 34.3
47	Eltanin	91 07.3	+51 29.4
54	Enif	34 31.1	+ 9 39.8
56	Fomalhaut	16 13.2	−29 52.1
31	Gacrux	172 50.5	−56 51.3
29	Gienah	176 38.0	−17 17.3
35	Hadar	149 51.3	−60 09.0
6	Hamal	328 51.1	+23 15.0
48	Kaus Aust.	84 43.2	−34 24.5
40	Kochab	137 17.9	+74 20.1
57	Markab	14 23.0	+14 57.6
8	Menkar	315 01.5	+ 3 54.7
36	Menkent	149 00.2	−36 08.7
24	Miapl'dus	221 48.6	−69 31.6
9	Mirfak	309 44.0	+49 42.3
50	Nunki	76 53.8	−26 21.4
52	Peacock	54 29.8	−56 53.1
21	Pollux	244 21.7	+28 08.3
20	Procyon	245 46.0	+ 5 20.6
46	R'alhague	96 48.0	+12 35.3
26	Regulus	208 30.5	+12 11.4
11	Rigel	281 54.6	− 8 15.2
38	Rigil Kent.	140 52.9	−60 38.7
44	Sabik	103 03.9	−15 40.3
3	Schedar	350 31.7	+56 17.5
45	Shaula	97 22.7	−37 04.3
18	Sirius	259 12.6	−16 39.2
33	Spica	159 18.2	−10 55.5
23	Suhail	223 24.9	−43 14.8
49	Vega	81 09.5	+38 44.2
39	Zub'g'bi	137 54.8	−15 51.2

Lat.	Sunrise	Twlt. begins	Moonrise 19	20	21	22
N °	h m	h m	h m	h m	h m	h m
72	■	6 27	□	16 21	18 34	20 31
70	11 09	6 25	14 22	16 47	18 46	20 34
68	10 12	6 19	15 04	17 07	18 55	20 36
66	9 39	6 16	15 32	17 22	19 03	20 38
64	9 15	6 13	15 53	17 35	19 09	20 39
62	8 56	6 10	16 11	17 45	19 15	20 40
60	8 40	6 07	16 25	17 54	19 20	20 42
58	8 27	6 04	16 37	18 02	19 24	20 43
56	8 16	6 02	16 47	18 09	19 28	20 43
54	8 06	6 00	16 56	18 15	19 31	20 44
52	7 57	5 57	17 04	18 20	19 34	20 45
50	7 49	5 55	17 12	18 25	19 37	20 46
45	7 32	5 49	17 27	18 36	19 43	20 47
40	7 18	5 44	17 40	18 45	19 48	20 48
35	7 06	5 38	17 50	18 52	19 52	20 49
30	6 56	5 32	18 00	18 59	19 56	20 50
20	6 38	5 21	18 16	19 10	20 02	20 52
10	6 22	5 08	18 30	19 20	20 08	20 53
0	6 07	4 54	18 43	19 30	20 13	20 55
10	5 52	4 36	18 56	19 39	20 18	20 56
20	5 36	4 15	19 10	19 49	20 24	20 57
30	5 18	3 45	19 26	20 00	20 30	20 59
35	5 07	3 25	19 35	20 06	20 34	21 00
40	4 54	2 59	19 45	20 13	20 38	21 01
45	4 39	2 24	19 57	20 22	20 43	21 02
50	4 20	1 20	20 12	20 32	20 49	21 04
52	4 12	////	20 19	20 37	20 51	21 04
54	4 02	////	20 26	20 42	20 54	21 05
56	3 51	////	20 35	20 47	20 57	21 06
58	3 38	////	20 44	20 54	21 01	21 07
60 S	3 23	////	20 55	21 01	21 05	21 08

Lat.	Sunset	Twlt. ends	Moonset 19	20	21	22
N °	h m	h m	h m	h m	h m	h m
72	■	17 57	□	10 37	9 57	9 28
70	13 14	18 02	10 57	10 10	9 43	9 22
68	14 11	18 05	10 13	9 49	9 32	9 18
66	14 44	18 08	9 44	9 32	9 22	9 14
64	15 08	18 11	9 22	9 18	9 14	9 10
62	15 27	18 14	9 04	9 06	9 07	9 07
60	15 43	18 17	8 49	8 56	9 01	9 05
58	15 56	18 19	8 36	8 48	8 56	9 02
56	16 07	18 22	8 25	8 40	8 51	9 00
54	16 17	18 24	8 15	8 33	8 47	8 58
52	16 26	18 27	8 06	8 27	8 43	8 57
50	16 34	18 29	7 58	8 21	8 39	8 55
45	16 50	18 33	7 42	8 09	8 32	8 52
40	17 04	18 39	7 28	7 59	8 25	8 49
35	17 16	18 44	7 16	7 50	8 19	8 46
30	17 27	18 50	7 06	7 42	8 14	8 44
20	17 44	19 01	6 48	7 29	8 06	8 40
10	18 00	19 14	6 32	7 17	7 58	8 36
0	18 15	19 28	6 17	7 06	7 51	8 33
10	18 29	19 45	6 02	6 54	7 43	8 30
20	18 45	20 06	5 46	6 42	7 36	8 26
30	19 04	20 36	5 28	6 29	7 26	8 22
35	19 15	20 56	5 17	6 21	7 21	8 20
40	19 27	21 20	5 05	6 11	7 15	8 17
45	19 42	21 55	4 50	6 00	7 08	8 14
50	20 01	22 57	4 32	5 47	7 00	8 10
52	20 09	////	4 23	5 41	6 56	8 08
54	20 19	////	4 14	5 34	6 52	8 06
56	20 30	////	4 03	5 26	6 47	8 04
58	20 43	////	3 50	5 17	6 41	8 02
60 S	20 58	////	3 36	5 07	6 35	7 59

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.6	0.1	0.1
30			
	0.6	0.1	0.1
45			
	0.6	0.1	0.1
60			
	0.6	0.0	0.0
75			
	0.6	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	19	20	21
°	′	′	′
0			
	14.8	14.2	13.4
4			
	14.8	14.2	13.4
8			
	14.8	14.2	13.4
12			
	14.8	14.2	13.4
16			
	14.8	14.2	13.5
20			
	14.8	14.2	13.5
24			
	14.8	14.3	13.6
28			
	14.9	14.3	13.6
32			
	14.9	14.3	13.7
36			
	14.9	14.4	13.7
40			
	14.9	14.4	13.8
44			
	15.0	14.5	13.9
48			
	15.0	14.5	14.0
52			
	15.0	14.6	14.1
56			
	15.1	14.7	14.2
60			
	15.1	14.7	14.3
64			
	15.1	14.8	14.4
68			
	15.2	14.9	14.5
72			
	15.2	14.9	14.6
76			
	15.3	15.0	14.7
80			
	15.3	15.1	14.9
84			
	15.3	15.2	15.0
88			
	15.4	15.2	15.1
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	19	20	21
°	′	′	′
0			
	16.0	16.4	16.8
4			
	16.0	16.3	16.8
8			
	16.0	16.3	16.8
12			
	16.0	16.3	16.7
16			
	16.0	16.3	16.7
20			
	15.9	16.3	16.7
24			
	15.9	16.2	16.6
28			
	15.9	16.2	16.6
32			
	15.9	16.2	16.5
36			
	15.9	16.1	16.4
40			
	15.8	16.1	16.4
44			
	15.8	16.0	16.3
48			
	15.8	16.0	16.2
52			
	15.7	15.9	16.1
56			
	15.7	15.8	16.0
60			
	15.7	15.8	15.9
64			
	15.6	15.7	15.8
68			
	15.6	15.6	15.7
72			
	15.6	15.6	15.6
76			
	15.5	15.5	15.4
80			
	15.5	15.4	15.3
84			
	15.4	15.3	15.2
88			
	15.4	15.3	15.1
90			

Subtract from table, back cover

GMT	Equation of Time (App.—Mean) 19	20	21
h	m s	m s	m s
0	−10 33.8	−10 52.3	−11 09.9
6	−10 38.5	−10 56.7	−11 14.2
12	−10 43.1	−11 01.2	−11 18.5
18	−10 47.7	−11 05.6	−11 22.7
24	−10 52.3	−11 09.9	−11 26.9

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
19	0 05	12 01	7 10	21 10	6 36
20	0 54	12 02	7 08	21 05	6 32
21	1 40	12 04	7 06	21 01	6 28
22	2 23	12 05	7 05	20 57	6 24

Full Moon 19

GMT	♈ GHA	VENUS −3.5 GHA	VENUS Dec.	MARS 1.4 GHA	MARS Dec.	JUPITER −2.2 GHA	JUPITER Dec.	SATURN 0.8 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
22 0	120 48.6	178 55.5	−21 10.8	253 40.3	−16 32.1	44 50.4	+22 24.9	263 38.4	−12 07.0	325 13.5	155	+ 6 26.4	−131
1	135 51.0	193 54.7	10.2	268 41.3	32.5	59 53.1	24.9	278 40.8	07.0	339 48.0	155	6 13.3	−132
2	150 53.5	208 53.9	09.6	283 42.3	32.9	74 55.7	24.9	293 43.2	07.1	354 22.5	156	6 00.1	−131
3	165 55.9	223 53.0	·· 09.0	298 43.3	·· 33.3	89 58.3	·· 24.9	308 45.5	·· 07.1	8 57.1	156	· 5 47.0	−132
4	180 58.4	238 52.2	08.4	313 44.4	33.7	105 01.0	24.9	323 47.9	07.1	23 31.7	157	5 33.8	−132
5	196 00.9	253 51.3	07.8	328 45.4	34.2	120 03.6	24.9	338 50.2	07.1	38 06.4	157	5 20.6	−132
6	211 03.3	268 50.5	−21 07.3	343 46.4	−16 34.6	135 06.3	+22 24.9	353 52.6	−12 07.2	52 41.1	157	+ 5 07.4	−132
7	226 05.8	283 49.6	06.7	358 47.4	35.0	150 08.9	24.9	8 54.9	07.2	67 15.8	158	4 54.2	−132
8	241 08.3	298 48.8	06.1	13 48.4	35.4	165 11.5	24.9	23 57.3	07.2	81 50.6	158	4 41.0	−132
9	256 10.7	313 47.9	·· 05.5	28 49.4	·· 35.8	180 14.2	·· 24.9	38 59.6	·· 07.2	96 25.4	159	· 4 27.8	−133
10	271 13.2	328 47.1	04.9	43 50.4	36.2	195 16.8	24.8	54 02.0	07.3	111 00.3	159	4 14.5	−132
11	286 15.7	343 46.3	04.3	58 51.4	36.6	210 19.4	24.8	69 04.3	07.3	125 35.2	159	4 01.3	−132
12	301 18.1	358 45.4	−21 03.7	73 52.5	−16 37.0	225 22.1	+22 24.8	84 06.7	−12 07.3	140 10.1	160	+ 3 48.1	−133
13	316 20.6	13 44.6	03.1	88 53.5	37.4	240 24.7	24.8	99 09.0	07.3	154 45.1	160	3 34.8	−132
14	331 23.1	28 43.7	02.5	103 54.5	37.8	255 27.3	24.8	114 11.4	07.4	169 20.1	160	3 21.6	−133
15	346 25.5	43 42.9	·· 01.9	118 55.5	·· 38.2	270 30.0	·· 24.8	129 13.7	·· 07.4	183 55.1	161	· 3 08.3	−132
16	1 28.0	58 42.1	01.3	133 56.5	38.6	285 32.6	24.8	144 16.1	07.4	198 30.2	161	2 55.1	−133
17	16 30.4	73 41.2	00.7	148 57.5	39.0	300 35.2	24.8	159 18.5	07.4	213 05.3	161	2 41.8	−133
18	31 32.9	88 40.4	−21 00.1	163 58.5	−16 39.4	315 37.9	+22 24.8	174 20.8	−12 07.5	227 40.4	161	+ 2 28.5	−132
19	46 35.4	103 39.5	20 59.4	178 59.5	39.8	330 40.5	24.8	189 23.2	07.5	242 15.5	162	2 15.3	−133
20	61 37.8	118 38.7	58.8	194 00.6	40.2	345 43.1	24.8	204 25.5	07.5	256 50.7	162	2 02.0	−132
21	76 40.3	133 37.9	·· 58.2	209 01.6	·· 40.6	0 45.8	·· 24.8	219 27.9	·· 07.5	271 25.9	162	· 1 48.8	−133
22	91 42.8	148 37.0	57.6	224 02.6	41.0	15 48.4	24.8	234 30.2	07.6	286 01.1	163	1 35.5	−133
23	106 45.2	163 36.2	57.0	239 03.6	41.4	30 51.0	24.8	249 32.6	07.6	300 36.4	163	1 22.2	−132
23 0	121 47.7	178 35.4	−20 56.4	254 04.6	−16 41.8	45 53.6	+22 24.7	264 34.9	−12 07.6	315 11.7	163	+ 1 09.0	−132
1	136 50.2	193 34.5	55.8	269 05.6	42.2	60 56.3	24.7	279 37.3	07.6	329 47.0	163	0 55.8	−133
2	151 52.6	208 33.7	55.2	284 06.6	42.6	75 58.9	24.7	294 39.7	07.7	344 22.3	163	0 42.5	−132
3	166 55.1	223 32.9	·· 54.5	299 07.6	·· 43.0	91 01.5	·· 24.7	309 42.0	·· 07.7	358 57.6	164	· 0 29.3	−132
4	181 57.5	238 32.0	53.9	314 08.7	43.5	106 04.2	24.7	324 44.4	07.7	13 33.0	164	0 16.1	−133
5	197 00.0	253 31.2	53.3	329 09.7	43.9	121 06.8	24.7	339 46.7	07.7	28 08.4	164	+ 0 02.8	−132
6	212 02.5	268 30.4	−20 52.7	344 10.7	−16 44.3	136 09.4	+22 24.7	354 49.1	−12 07.8	42 43.8	164	− 0 10.4	−132
7	227 04.9	283 29.5	52.1	359 11.7	44.7	151 12.0	24.7	9 51.4	07.8	57 19.2	164	0 23.6	−132
8	242 07.4	298 28.7	51.5	14 12.7	45.1	166 14.7	24.7	24 53.8	07.8	71 54.6	164	0 36.8	−132
9	257 09.9	313 27.9	·· 50.8	29 13.7	·· 45.5	181 17.3	·· 24.7	39 56.2	·· 07.8	86 30.0	165	· 0 50.0	−131
10	272 12.3	328 27.0	50.2	44 14.7	45.9	196 19.9	24.7	54 58.5	07.9	101 05.5	164	1 03.1	−132
11	287 14.8	343 26.2	49.6	59 15.7	46.3	211 22.6	24.7	70 00.9	07.9	115 40.9	165	1 16.3	−131
12	302 17.3	358 25.4	−20 49.0	74 16.8	−16 46.7	226 25.2	+22 24.7	85 03.2	−12 07.9	130 16.4	165	− 1 29.4	−132
13	317 19.7	13 24.5	48.3	89 17.8	47.1	241 27.8	24.7	100 05.6	07.9	144 51.9	165	1 42.6	−131
14	332 22.2	28 23.7	47.7	104 18.8	47.5	256 30.4	24.7	115 07.9	08.0	159 27.4	165	1 55.7	−131
15	347 24.7	43 22.9	·· 47.1	119 19.8	·· 47.9	271 33.1	·· 24.6	130 10.3	·· 08.0	174 02.9	165	· 2 08.8	−131
16	2 27.1	58 22.1	46.4	134 20.8	48.3	286 35.7	24.6	145 12.7	08.0	188 38.4	165	2 21.9	−131
17	17 29.6	73 21.2	45.8	149 21.8	48.7	301 38.3	24.6	160 15.0	08.0	203 13.9	165	2 35.0	−130
18	32 32.0	88 20.4	−20 45.2	164 22.8	−16 49.1	316 40.9	+22 24.6	175 17.4	−12 08.1	217 49.4	165	− 2 48.0	−131
19	47 34.5	103 19.6	44.5	179 23.8	49.5	331 43.6	24.6	190 19.7	08.1	232 24.9	165	3 01.1	−130
20	62 37.0	118 18.8	43.9	194 24.9	49.9	346 46.2	24.6	205 22.1	08.1	247 00.4	166	3 14.1	−130
21	77 39.4	133 17.9	·· 43.3	209 25.9	·· 50.3	1 48.8	·· 24.6	220 24.5	·· 08.1	261 36.0	165	· 3 27.1	−130
22	92 41.9	148 17.1	42.6	224 26.9	50.7	16 51.4	24.6	235 26.8	08.2	276 11.5	165	3 40.1	−130
23	107 44.4	163 16.3	42.0	239 27.9	51.1	31 54.0	24.6	250 29.2	08.2	290 47.0	165	3 53.1	−129
24 0	122 46.8	178 15.5	−20 41.4	254 28.9	−16 51.5	46 56.7	+22 24.6	265 31.5	−12 08.2	305 22.5	165	− 4 06.0	−130
1	137 49.3	193 14.6	40.7	269 29.9	51.9	61 59.3	24.6	280 33.9	08.2	319 58.0	166	4 19.0	−129
2	152 51.8	208 13.8	40.1	284 30.9	52.2	77 01.9	24.6	295 36.3	08.3	334 33.6	165	4 31.9	−128
3	167 54.2	223 13.0	·· 39.4	299 31.9	·· 52.6	92 04.5	·· 24.6	310 38.6	·· 08.3	349 09.1	165	· 4 44.7	−129
4	182 56.7	238 12.2	38.8	314 33.0	53.0	107 07.1	24.6	325 41.0	08.3	3 44.6	165	4 57.6	−128
5	197 59.2	253 11.3	38.2	329 34.0	53.4	122 09.8	24.6	340 43.3	08.3	18 20.1	165	5 10.4	−129
6	213 01.6	268 10.5	−20 37.5	344 35.0	−16 53.8	137 12.4	+22 24.6	355 45.7	−12 08.3	32 55.6	164	− 5 23.3	−127
7	228 04.1	283 09.7	36.9	359 36.0	54.2	152 15.0	24.5	10 48.1	08.4	47 31.0	165	5 36.0	−128
8	243 06.5	298 08.9	36.2	14 37.0	54.6	167 17.6	24.5	25 50.4	08.4	62 06.5	165	5 48.8	−127
9	258 09.0	313 08.1	·· 35.6	29 38.0	·· 55.0	182 20.2	·· 24.5	40 52.8	·· 08.4	76 42.0	164	· 6 01.5	−128
10	273 11.5	328 07.2	34.9	44 39.0	55.4	197 22.9	24.5	55 55.1	08.4	91 17.4	165	6 14.3	−126
11	288 13.9	343 06.4	34.3	59 40.0	55.8	212 25.5	24.5	70 57.5	08.5	105 52.9	164	6 26.9	−127
12	303 16.4	358 05.6	−20 33.6	74 41.1	−16 56.2	227 28.1	+22 24.5	85 59.9	−12 08.5	120 28.3	164	− 6 39.6	−126
13	318 18.9	13 04.8	33.0	89 42.1	56.6	242 30.7	24.5	101 02.2	08.5	135 03.7	164	6 52.2	−126
14	333 21.3	28 04.0	32.3	104 43.1	57.0	257 33.3	24.5	116 04.6	08.5	149 39.1	164	7 04.8	−126
15	348 23.8	43 03.1	·· 31.7	119 44.1	·· 57.4	272 35.9	·· 24.5	131 07.0	·· 08.6	164 14.5	164	· 7 17.4	−125
16	3 26.3	58 02.3	31.0	134 45.1	57.8	287 38.6	24.5	146 09.3	08.6	178 49.9	163	7 29.9	−125
17	18 28.7	73 01.5	30.4	149 46.1	58.2	302 41.2	24.5	161 11.7	08.6	193 25.2	163	7 42.4	−125
18	33 31.2	88 00.7	−20 29.7	164 47.1	−16 58.6	317 43.8	+22 24.5	176 14.0	−12 08.6	208 00.5	163	− 7 54.9	−124
19	48 33.6	102 59.9	29.0	179 48.1	59.0	332 46.4	24.5	191 16.4	08.6	222 35.8	163	8 07.3	−124
20	63 36.1	117 59.1	28.4	194 49.2	59.4	347 49.0	24.5	206 18.8	08.7	237 11.1	163	8 19.7	−124
21	78 38.6	132 58.3	·· 27.7	209 50.2	·16 59.8	2 51.6	·· 24.5	221 21.1	·· 08.7	251 46.4	162	· 8 32.1	−124
22	93 41.0	147 57.4	27.1	224 51.2	17 00.2	17 54.3	24.5	236 23.5	08.7	266 21.6	162	8 44.5	−123
23	108 43.5	162 56.6	26.4	239 52.2	00.6	32 56.9	24.5	251 25.9	08.7	280 56.8	162	8 56.8	−122
24	123 46.0	177 55.8	−20 25.7	254 53.2	−17 01.0	47 59.5	+22 24.5	266 28.2	−12 08.8	295 32.0	162	− 9 09.0	−123
code	—	− 9	+ 7	+ 10	− 4	+ 26	0	+ 24	0				

GMT	h	SUN GHA		SUN Dec.
	h	° ′		° ′
22	0	177 08.2		−19 50.8
	1	192 08.0		50.2
	2	207 07.9		49.7
	3	222 07.7	••	49.1
	4	237 07.5		48.5
	5	252 07.3		48.0
	6	267 07.2		−19 47.4
	7	282 07.0		46.8
	8	297 06.8		46.3
	9	312 06.7	••	45.7
	10	327 06.5		45.1
	11	342 06.3		44.6
	12	357 06.2		−19 44.0
	13	12 06.0		43.4
	14	27 05.8		42.9
	15	42 05.6	••	42.3
	16	57 05.5		41.7
	17	72 05.3		41.2
	18	87 05.1		−19 40.6
	19	102 05.0		40.0
	20	117 04.8		39.4
	21	132 04.6	••	38.9
	22	147 04.5		38.3
	23	162 04.3		37.7
23	0	177 04.2		−19 37.1
	1	192 04.0		36.6
	2	207 03.8		36.0
	3	222 03.7	••	35.4
	4	237 03.5		34.8
	5	252 03.3		34.3
	6	267 03.2		−19 33.7
	7	282 03.0		33.1
	8	297 02.8		32.5
	9	312 02.7	••	31.9
	10	327 02.5		31.3
	11	342 02.4		30.8
	12	357 02.2		−19 30.2
	13	12 02.0		29.6
	14	27 01.9		29.0
	15	42 01.7	••	28.4
	16	57 01.6		27.8
	17	72 01.4		27.3
	18	87 01.2		−19 26.7
	19	102 01.1		26.1
	20	117 00.9		25.5
	21	132 00.8	••	24.9
	22	147 00.6		24.3
	23	162 00.5		23.7
24	0	177 00.3		−19 23.1
	1	192 00.1		22.5
	2	207 00.0		21.9
	3	221 59.8	••	21.4
	4	236 59.7		20.8
	5	251 59.5		20.2
	6	266 59.4		−19 19.6
	7	281 59.2		19.0
	8	296 59.1		18.4
	9	311 58.9	••	17.8
	10	326 58.8		17.2
	11	341 58.6		16.6
	12	356 58.4		−19 16.0
	13	11 58.3		15.4
	14	26 58.1		14.8
	15	41 58.0	••	14.2
	16	56 57.8		13.6
	17	71 57.7		13.0
	18	86 57.5		−19 12.4
	19	101 57.4		11.8
	20	116 57.2		11.2
	21	131 57.1	••	10.6
	22	146 56.9		10.0
	23	161 56.8		09.4
	24	176 56.6		−19 08.8
code		—		+ 6

STARS

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.9	−40 29.4
5	Achernar	335 59.7	−57 28.4
30	Acrux	173 59.0	−62 50.6
19	Adhara	255 47.2	−28 54.6
10	Aldebaran	291 40.3	+16 25.2
32	Alioth	166 59.3	+56 12.1
34	Alkaid	153 33.7	+49 32.1
55	Al Na'ir	28 39.9	−47 11.2
15	Alnilam	276 31.3	− 1 13.8
25	Alphard	218 39.5	− 8 27.6
41	Alphecca	126 48.8	+26 51.8
1	Alpheratz	358 29.8	+28 50.4
51	Altair	62 52.0	+ 8 44.7
2	Ankaa	353 59.6	−42 33.5
42	Antares	113 21.1	−26 20.0
37	Arcturus	146 36.3	+19 24.9
43	Atria	109 03.4	−68 56.7
22	Avior	234 35.7	−59 21.7
13	Bellatrix	279 19.5	+ 6 18.6
16	Betelg'se	271 49.2	+ 7 24.0
17	Canopus	264 15.4	−52 40.3
12	Capella	281 39.9	+45 57.4
53	Deneb	50 02.4	+45 06.9
28	Denebola	183 18.8	+14 49.5
4	Diphda	349 40.6	−18 14.4
27	Dubhe	194 45.4	+61 59.6
14	Elnath	279 08.6	+28 34.3
47	Eltanin	91 07.3	+51 29.4
54	Enif	34 31.1	+ 9 39.8
56	Fomalhaut	16 13.2	−29 52.1
31	Gacrux	172 50.5	−56 51.3
29	Gienah	176 38.0	−17 17.3
35	Hadar	149 51.3	−60 09.0
6	Hamal	328 51.1	+23 15.0
48	Kaus Aust.	84 43.2	−34 24.5
40	Kochab	137 17.9	+74 20.1
57	Markab	14 23.0	+14 57.5
8	Menkar	315 01.5	+ 3 54.7
36	Menkent	149 00.2	−36 08.7
24	Miapl'dus	221 48.6	−69 31.6
9	Mirfak	309 44.0	+49 42.3
50	Nunki	76 53.8	−26 21.4
52	Peacock	54 29.8	−56 53.1
21	Pollux	244 21.7	+28 08.3
20	Procyon	245 45.9	+ 5 20.6
46	R'alhague	96 48.0	+12 35.3
26	Regulus	208 30.5	+12 11.4
11	Rigel	281 54.6	− 8 15.2
38	Rigil Kent.	140 52.9	−60 38.8
44	Sabik	103 03.9	−15 40.3
3	Schedar	350 31.7	+56 17.5
45	Shaula	97 22.7	−37 04.3
18	Sirius	259 12.6	−16 39.2
33	Spica	159 18.2	−10 55.5
23	Suhail	223 24.9	−43 14.8
49	Vega	81 09.5	+38 44.2
39	Zub'g'bi	137 54.8	−15 51.2

Lat.	Sunrise	Twlt. begins	Moonrise 22	Moonrise 23	Moonrise 24	Moonrise 25
N °	h m	h m	h m	h m	h m	h m
72	■	6 20	20 31	22 24	24 20	0 20
70	10 44	6 17	20 34	22 18	24 05	0 05
68	9 58	6 14	20 36	22 14	23 53	25 37
66	9 29	6 11	20 38	22 10	23 43	25 19
64	9 07	6 08	20 39	22 07	23 34	25 05
62	8 49	6 06	20 40	22 04	23 28	24 53
60	8 34	6 03	20 42	22 02	23 21	24 43
58	8 22	6 02	20 43	22 00	23 16	24 34
56	8 11	5 59	20 43	21 58	23 12	24 26
54	8 02	5 57	20 44	21 56	23 07	24 19
52	7 53	5 55	20 45	21 54	23 03	24 13
50	7 46	5 53	20 46	21 53	23 00	24 08
45	7 30	5 47	20 47	21 50	22 53	23 56
40	7 16	5 42	20 48	21 48	22 47	23 46
35	7 05	5 37	20 49	21 46	22 41	23 38
30	6 55	5 32	20 50	21 44	22 37	23 30
20	6 38	5 21	20 52	21 40	22 29	23 18
10	6 23	5 08	20 53	21 38	22 22	23 07
0	6 08	4 55	20 55	21 35	22 15	22 57
10	5 54	4 38	20 56	21 32	22 09	22 47
20	5 38	4 17	20 57	21 30	22 02	22 36
30	5 20	3 48	20 59	21 27	21 55	22 24
35	5 10	3 29	21 00	21 25	21 50	22 17
40	4 57	3 04	21 01	21 23	21 45	22 09
45	4 43	2 31	21 02	21 21	21 39	22 00
50	4 25	1 34	21 04	21 18	21 33	21 49
52	4 17	0 45	21 04	21 17	21 29	21 44
54	4 08	////	21 05	21 15	21 26	21 38
56	3 57	////	21 06	21 14	21 22	21 32
58	3 45	////	21 07	21 12	21 18	21 25
60	3 31	////	21 08	21 10	21 13	21 17
S						

Lat.	Sunset	Twlt. ends	Moonset 22	Moonset 23	Moonset 24	Moonset 25
N °	h m	h m	h m	h m	h m	h m
72	■	18 06	9 28	9 03	8 37	8 06
70	13 41	18 10	9 22	9 04	8 45	8 24
68	14 26	18 12	9 18	9 05	8 52	8 37
66	14 56	18 15	9 14	9 06	8 57	8 49
64	15 18	18 18	9 10	9 06	9 02	8 58
62	15 35	18 20	9 07	9 07	9 07	9 07
60	15 50	18 22	9 05	9 08	9 10	9 14
58	16 02	18 24	9 02	9 08	9 14	9 20
56	16 13	18 26	9 00	9 08	9 17	9 26
54	16 23	18 29	8 58	9 09	9 19	9 31
52	16 31	18 31	8 57	9 09	9 22	9 35
50	16 38	18 32	8 55	9 10	9 24	9 39
45	16 55	18 38	8 52	9 10	9 29	9 48
40	17 08	18 42	8 49	9 11	9 33	9 56
35	17 19	18 47	8 46	9 11	9 36	10 02
30	17 29	18 52	8 44	9 12	9 40	10 08
20	17 46	19 03	8 40	9 13	9 45	10 18
10	18 01	19 14	8 36	9 13	9 50	10 27
0	18 15	19 28	8 33	9 14	9 54	10 35
10	18 29	19 44	8 30	9 15	9 59	10 43
20	18 45	20 06	8 26	9 15	10 04	10 52
30	19 03	20 34	8 22	9 16	10 09	11 02
35	19 13	20 52	8 20	9 17	10 12	11 08
40	19 25	21 17	8 17	9 17	10 16	11 15
45	19 39	21 50	8 14	9 18	10 20	11 23
50	19 57	22 45	8 10	9 18	10 25	11 32
52	20 05	23 28	8 08	9 18	10 28	11 37
54	20 15	////	8 06	9 19	10 30	11 42
56	20 25	////	8 04	9 19	10 33	11 47
58	20 37	////	8 02	9 20	10 36	11 53
60	20 51	////	7 59	9 20	10 40	12 00
S						

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.6	0.1	0.1
30	0.6	0.1	0.1
45	0.6	0.1	0.1
60	0.6	0.0	0.0
75	0.6	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	22	23	24
°	′	′	′
0	12.9	12.4	12.1
4	12.9	12.4	12.1
8	12.9	12.4	12.2
12	12.9	12.4	12.2
16	13.0	12.5	12.2
20	13.0	12.6	12.3
24	13.1	12.6	12.4
28	13.2	12.7	12.5
32	13.2	12.8	12.6
36	13.3	12.9	12.7
40	13.4	13.0	12.8
44	13.5	13.1	12.9
48	13.6	13.3	13.1
52	13.7	13.4	13.2
56	13.9	13.5	13.4
60	14.0	13.7	13.5
64	14.1	13.9	13.7
68	14.3	14.0	13.9
72	14.4	14.2	14.1
76	14.5	14.4	14.3
80	14.7	14.5	14.4
84	14.8	14.7	14.6
88	14.9	14.8	14.8
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	22	23	24
°	′	′	′
0	17.1	17.4	17.5
4	17.1	17.4	17.5
8	17.0	17.3	17.5
12	17.0	17.3	17.4
16	17.0	17.2	17.4
20	16.9	17.2	17.3
24	16.9	17.1	17.2
28	16.8	17.0	17.2
32	16.7	16.9	17.1
36	16.6	16.8	16.9
40	16.5	16.7	16.8
44	16.4	16.6	16.7
48	16.3	16.5	16.6
52	16.2	16.3	16.4
56	16.1	16.2	16.2
60	16.0	16.0	16.1
64	15.8	15.9	15.9
68	15.7	15.7	15.7
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.3	15.2	15.2
84	15.1	15.0	15.0
88	15.0	14.9	14.9
90			

Subtract from table, back cover

Equation of Time (App.—Mean)

GMT	22	23	24
h	m s	m s	m s
0	−11 26.9	−11 43.1	−11 58.5
6	−11 31.0	−11 47.0	−12 02.2
12	−11 35.1	−11 50.9	−12 05.9
18	−11 39.1	−11 54.7	−12 09.5
24	−11 43.1	−11 58.5	−12 13.1

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
22	2 23	12 05	7 05	20 57	6 24
23	3 04	12 06	7 03	20 53	6 21
24	3 45	12 08	7 02	20 49	6 17
25	4 25	12 09	7 00	20 44	6 13

GMT	♈ GHA	VENUS −3.5 GHA	VENUS Dec.	MARS 1.3 GHA	MARS Dec.	JUPITER −2.1 GHA	JUPITER Dec.	SATURN 0.8 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
25 0	123 46.0	177 55.8	−20 25.7	254 53.2	−17 01.0	47 59.5	+22 24.5	266 28.2	−12 08.8	295 32.0	162	− 9 09.0	−123
1	138 48.4	192 55.0	25.1	269 54.2	01.3	63 02.1	24.4	281 30.6	08.8	310 07.2	161	9 21.3	−121
2	153 50.9	207 54.2	24.4	284 55.2	01.7	78 04.7	24.4	296 33.0	08.8	324 42.3	162	9 33.4	−122
3	168 53.4	222 53.4	·· 23.7	299 56.2	·· 02.1	93 07.3	·· 24.4	311 35.3	·· 08.8	339 17.5	160	· 9 45.6	−121
4	183 55.8	237 52.6	23.1	314 57.3	02.5	108 09.9	24.4	326 37.7	08.8	353 52.5	161	9 57.7	−121
5	198 58.3	252 51.8	22.4	329 58.3	02.9	123 12.5	24.4	341 40.0	08.9	8 27.6	160	10 09.8	−120
6	214 00.8	267 50.9	−20 21.7	344 59.3	−17 03.3	138 15.2	+22 24.4	356 42.4	−12 08.9	23 02.6	160	−10 21.8	−120
7	229 03.2	282 50.1	21.1	0 00.3	03.7	153 17.8	24.4	11 44.8	08.9	37 37.6	160	10 33.8	−120
8	244 05.7	297 49.3	20.4	15 01.3	04.1	168 20.4	24.4	26 47.1	08.9	52 12.6	159	10 45.8	−119
9	259 08.1	312 48.5	·· 19.7	30 02.3	·· 04.5	183 23.0	·· 24.4	41 49.5	·· 09.0	66 47.5	159	·10 57.7	−119
10	274 10.6	327 47.7	19.0	45 03.3	04.9	198 25.6	24.4	56 51.9	09.0	81 22.4	158	11 09.6	−118
11	289 13.1	342 46.9	18.4	60 04.3	05.3	213 28.2	24.4	71 54.2	09.0	95 57.2	158	11 21.4	−118
12	304 15.5	357 46.1	−20 17.7	75 05.4	−17 05.7	228 30.8	+22 24.4	86 56.6	−12 09.0	110 32.0	158	−11 33.2	−117
13	319 18.0	12 45.3	17.0	90 06.4	06.1	243 33.4	24.4	101 59.0	09.0	125 06.8	158	11 44.9	−117
14	334 20.5	27 44.5	16.3	105 07.4	06.4	258 36.0	24.4	117 01.3	09.1	139 41.6	157	11 56.6	−117
15	349 22.9	42 43.7	·· 15.7	120 08.4	·· 06.8	273 38.6	·· 24.4	132 03.7	·· 09.1	154 16.3	156	·12 08.3	−116
16	4 25.4	57 42.9	15.0	135 09.4	07.2	288 41.2	24.4	147 06.1	09.1	168 50.9	157	12 19.9	−116
17	19 27.9	72 42.1	14.3	150 10.4	07.6	303 43.8	24.4	162 08.4	09.1	183 25.6	156	12 31.5	−115
18	34 30.3	87 41.3	−20 13.6	165 11.4	−17 08.0	318 46.5	+22 24.4	177 10.8	−12 09.1	198 00.2	155	−12 43.0	−114
19	49 32.8	102 40.5	12.9	180 12.5	08.4	333 49.1	24.4	192 13.2	09.2	212 34.7	155	12 54.4	−114
20	64 35.2	117 39.7	12.2	195 13.5	08.8	348 51.7	24.4	207 15.5	09.2	227 09.2	154	13 05.8	−114
21	79 37.7	132 38.9	·· 11.6	210 14.5	·· 09.2	3 54.3	·· 24.3	222 17.9	·· 09.2	241 43.6	154	·13 17.2	−113
22	94 40.2	147 38.1	10.9	225 15.5	09.6	18 56.9	24.3	237 20.3	09.2	256 18.0	154	13 28.5	−113
23	109 42.6	162 37.3	10.2	240 16.5	10.0	33 59.5	24.3	252 22.6	09.3	270 52.4	153	13 39.8	−112
26 0	124 45.1	177 36.5	−20 09.5	255 17.5	−17 10.3	49 02.1	+22 24.3	267 25.0	−12 09.3	285 26.7	153	−13 51.0	−111
1	139 47.6	192 35.7	08.8	270 18.5	10.7	64 04.7	24.3	282 27.4	09.3	300 01.0	152	14 02.1	−111
2	154 50.0	207 34.9	08.1	285 19.5	11.1	79 07.3	24.3	297 29.7	09.3	314 35.2	152	14 13.2	−111
3	169 52.5	222 34.1	·· 07.4	300 20.6	·· 11.5	94 09.9	·· 24.3	312 32.1	·· 09.3	329 09.4	151	·14 24.3	−110
4	184 55.0	237 33.3	06.7	315 21.6	11.9	109 12.5	24.3	327 34.5	09.4	343 43.5	151	14 35.3	−109
5	199 57.4	252 32.5	06.0	330 22.6	12.3	124 15.1	24.3	342 36.8	09.4	358 17.6	150	14 46.2	−109
6	214 59.9	267 31.7	−20 05.3	345 23.6	−17 12.7	139 17.7	+22 24.3	357 39.2	−12 09.4	12 51.6	149	−14 57.1	−108
7	230 02.4	282 30.9	04.6	0 24.6	13.1	154 20.3	24.3	12 41.6	09.4	27 25.5	150	15 07.9	−108
8	245 04.8	297 30.1	03.9	15 25.6	13.4	169 22.9	24.3	27 44.0	09.4	41 59.5	148	15 18.7	−107
9	260 07.3	312 29.3	·· 03.2	30 26.6	·· 13.8	184 25.5	·· 24.3	42 46.3	·· 09.5	56 33.3	148	·15 29.4	−106
10	275 09.7	327 28.5	02.5	45 27.6	14.2	199 28.1	24.3	57 48.7	09.5	71 07.1	148	15 40.0	−106
11	290 12.2	342 27.7	01.8	60 28.7	14.6	214 30.7	24.3	72 51.1	09.5	85 40.9	146	15 50.6	−106
12	305 14.7	357 26.9	−20 01.1	75 29.7	−17 15.0	229 33.3	+22 24.3	87 53.4	−12 09.5	100 14.5	147	−16 01.2	−104
13	320 17.1	12 26.1	20 00.4	90 30.7	15.4	244 35.9	24.3	102 55.8	09.5	114 48.2	145	16 11.6	−104
14	335 19.6	27 25.3	19 59.7	105 31.7	15.8	259 38.5	24.3	117 58.2	09.6	129 21.7	146	16 22.0	−104
15	350 22.1	42 24.5	·· 59.0	120 32.7	·· 16.2	274 41.1	·· 24.3	133 00.5	·· 09.6	143 55.3	144	·16 32.4	−103
16	5 24.5	57 23.7	58.3	135 33.7	16.5	289 43.7	24.3	148 02.9	09.6	158 28.7	144	16 42.7	−102
17	20 27.0	72 22.9	57.6	150 34.7	16.9	304 46.3	24.3	163 05.3	09.6	173 02.1	143	16 52.9	−101
18	35 29.5	87 22.1	−19 56.9	165 35.7	−17 17.3	319 48.9	+22 24.3	178 07.7	−12 09.6	187 35.4	143	−17 03.0	−101
19	50 31.9	102 21.3	56.2	180 36.8	17.7	334 51.5	24.3	193 10.0	09.7	202 08.7	142	17 13.1	−100
20	65 34.4	117 20.6	55.5	195 37.8	18.1	349 54.1	24.2	208 12.4	09.7	216 41.9	142	17 23.1	−100
21	80 36.9	132 19.8	·· 54.8	210 38.8	·· 18.5	4 56.7	·· 24.2	223 14.8	·· 09.7	231 15.1	140	·17 33.1	− 98
22	95 39.3	147 19.0	54.1	225 39.8	18.8	19 59.3	24.2	238 17.1	09.7	245 48.1	141	17 42.9	− 98
23	110 41.8	162 18.2	53.4	240 40.8	19.2	35 01.9	24.2	253 19.5	09.7	260 21.2	139	17 52.7	− 98
27 0	125 44.2	177 17.4	−19 52.7	255 41.8	−17 19.6	50 04.5	+22 24.2	268 21.9	−12 09.8	274 54.1	139	−18 02.5	− 97
1	140 46.7	192 16.6	51.9	270 42.8	20.0	65 07.1	24.2	283 24.3	09.8	289 27.0	138	18 12.2	− 95
2	155 49.2	207 15.8	51.2	285 43.9	20.4	80 09.7	24.2	298 26.6	09.8	303 59.8	138	18 21.7	− 96
3	170 51.6	222 15.0	·· 50.5	300 44.9	·· 20.8	95 12.3	·· 24.2	313 29.0	·· 09.8	318 32.6	136	·18 31.3	− 94
4	185 54.1	237 14.2	49.8	315 45.9	21.2	110 14.9	24.2	328 31.4	09.8	333 05.2	137	18 40.7	− 94
5	200 56.6	252 13.5	49.1	330 46.9	21.5	125 17.5	24.2	343 33.7	09.9	347 37.9	135	18 50.1	− 93
6	215 59.0	267 12.7	−19 48.4	345 47.9	−17 21.9	140 20.1	+22 24.2	358 36.1	−12 09.9	2 10.4	135	−18 59.4	− 92
7	231 01.5	282 11.9	47.6	0 48.9	22.3	155 22.6	24.2	13 38.5	09.9	16 42.9	134	19 08.6	− 92
8	246 04.0	297 11.1	46.9	15 49.9	22.7	170 25.2	24.2	28 40.9	09.9	31 15.3	133	19 17.8	− 90
9	261 06.4	312 10.3	·· 46.2	30 50.9	·· 23.1	185 27.8	·· 24.2	43 43.2	·· 09.9	45 47.6	133	·19 26.8	− 90
10	276 08.9	327 09.5	45.5	45 52.0	23.4	200 30.4	24.2	58 45.6	10.0	60 19.9	132	19 35.8	− 89
11	291 11.4	342 08.8	44.7	60 53.0	23.8	215 33.0	24.2	73 48.0	10.0	74 52.1	131	19 44.7	− 89
12	306 13.8	357 08.0	−19 44.0	75 54.0	−17 24.2	230 35.6	+22 24.2	88 50.4	−12 10.0	89 24.2	130	−19 53.6	− 87
13	321 16.3	12 07.2	43.3	90 55.0	24.6	245 38.2	24.2	103 52.7	10.0	103 56.2	130	20 02.3	− 87
14	336 18.7	27 06.4	42.6	105 56.0	25.0	260 40.8	24.2	118 55.1	10.0	118 28.2	129	20 11.0	− 86
15	351 21.2	42 05.6	·· 41.8	120 57.0	·· 25.4	275 43.4	·· 24.2	133 57.5	·· 10.0	133 00.1	128	·20 19.6	− 85
16	6 23.7	57 04.8	41.1	135 58.0	25.7	290 46.0	24.2	148 59.9	10.1	147 31.9	128	20 28.1	− 84
17	21 26.1	72 04.1	40.4	150 59.1	26.1	305 48.6	24.2	164 02.2	10.1	162 03.7	127	20 36.5	− 83
18	36 28.6	87 03.3	−19 39.7	166 00.1	−17 26.5	320 51.1	+22 24.2	179 04.6	−12 10.1	176 35.4	126	−20 44.8	− 83
19	51 31.1	102 02.5	38.9	181 01.1	26.9	335 53.7	24.2	194 07.0	10.1	191 07.0	125	20 53.1	− 81
20	66 33.5	117 01.7	38.2	196 02.1	27.3	350 56.3	24.2	209 09.4	10.1	205 38.5	124	21 01.2	− 81
21	81 36.0	132 01.0	·· 37.5	211 03.1	·· 27.6	5 58.9	·· 24.2	224 11.7	·· 10.2	220 09.9	124	·21 09.3	− 80
22	96 38.5	147 00.2	36.7	226 04.1	28.0	21 01.5	24.2	239 14.1	10.2	234 41.3	123	21 17.3	− 79
23	111 40.9	161 59.4	36.0	241 05.1	28.4	36 04.1	24.2	254 16.5	10.2	249 12.6	122	21 25.2	− 78
24	126 43.4	176 58.6	−19 35.2	256 06.1	−17 28.8	51 06.7	+22 24.1	269 18.9	−12 10.2	263 43.8	122	−21 33.0	− 77
code	—	− 8	+ 7	+ 10	− 4	+ 26	0	+ 24	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
25 0	176 56.6	−19 08.8
1	191 56.5	08.2
2	206 56.3	07.5
3	221 56.2	•• 06.9
4	236 56.1	06.3
5	251 55.9	05.7
6	266 55.8	−19 05.1
7	281 55.6	04.5
8	296 55.5	03.9
9	311 55.3	•• 03.3
10	326 55.2	02.7
11	341 55.0	02.1
12	356 54.9	−19 01.4
13	11 54.7	00.8
14	26 54.6	19 00.2
15	41 54.5	·18 59.6
16	56 54.3	59.0
17	71 54.2	58.4
18	86 54.0	−18 57.8
19	101 53.9	57.1
20	116 53.7	56.5
21	131 53.6	•• 55.9
22	146 53.5	55.3
23	161 53.3	54.7
26 0	176 53.2	−18 54.0
1	191 53.0	53.4
2	206 52.9	52.8
3	221 52.8	•• 52.2
4	236 52.6	51.6
5	251 52.5	50.9
6	266 52.3	−18 50.3
7	281 52.2	49.7
8	296 52.1	49.1
9	311 51.9	•• 48.4
10	326 51.8	47.8
11	341 51.7	47.2
12	356 51.5	−18 46.6
13	11 51.4	45.9
14	26 51.2	45.3
15	41 51.1	•• 44.7
16	56 51.0	44.0
17	71 50.8	43.4
18	86 50.7	−18 42.8
19	101 50.6	42.1
20	116 50.4	41.5
21	131 50.3	•• 40.9
22	146 50.2	40.2
23	161 50.0	39.6
27 0	176 49.9	−18 39.0
1	191 49.8	38.3
2	206 49.6	37.7
3	221 49.5	•• 37.1
4	236 49.4	36.4
5	251 49.3	35.8
6	266 49.1	−18 35.2
7	281 49.0	34.5
8	296 48.9	33.9
9	311 48.7	•• 33.2
10	326 48.6	32.6
11	341 48.5	32.0
12	356 48.3	−18 31.3
13	11 48.2	30.7
14	26 48.1	30.0
15	41 48.0	•• 29.4
16	56 47.8	28.7
17	71 47.7	28.1
18	86 47.6	−18 27.5
19	101 47.5	26.8
20	116 47.3	26.2
21	131 47.2	•• 25.5
22	146 47.1	24.9
23	161 47.0	24.2
24	176 46.8	−18 23.6
code	—	+ 7

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.9	−40 29.4
5	Achernar	335 59.7	−57 28.4
30	Acrux	173 59.0	−62 50.6
19	Adhara	255 47.2	−28 54.6
10	Aldebaran	291 40.3	+16 25.2
32	Alioth	166 59.3	+56 12.1
34	Alkaid	153 33.7	+49 32.1
55	Al Na'ir	28 39.9	−47 11.2
15	Alnilam	276 31.3	− 1 13.8
25	Alphard	218 39.5	− 8 27.6
41	Alphecca	126 48.8	+26 51.8
1	Alpheratz	358 29.9	+28 50.4
51	Altair	62 52.0	+ 8 44.7
2	Ankaa	353 59.6	−42 33.5
42	Antares	113 21.1	−26 20.0
37	Arcturus	146 36.3	+19 24.9
43	Atria	109 03.3	−68 56.7
22	Avior	234 35.7	−59 21.7
13	Bellatrix	279 19.5	+ 6 18.6
16	Betelg'se	271 49.2	+ 7 24.0
17	Canopus	264 15.4	−52 40.3
12	Capella	281 39.9	+45 57.4
53	Deneb	50 02.4	+45 06.9
28	Denebola	183 18.8	+14 49.5
4	Diphda	349 40.6	−18 14.4
27	Dubhe	194 45.4	+61 59.6
14	Elnath	279 08.6	+28 34.3
47	Eltanin	91 07.3	+51 29.4
54	Enif	34 31.1	+ 9 39.8
56	Fomalhaut	16 13.2	−29 52.1
31	Gacrux	172 50.5	−56 51.3
29	Gienah	176 38.0	−17 17.3
35	Hadar	149 51.2	−60 09.0
6	Hamal	328 51.1	+23 15.0
48	Kaus Aust.	84 43.2	−34 24.5
40	Kochab	137 17.8	+74 20.1
57	Markab	14 23.0	+14 57.5
8	Menkar	315 01.5	+ 3 54.7
36	Menkent	149 00.2	−36 08.7
24	Miapl'dus	221 48.6	−69 31.7
9	Mirfak	309 44.1	+49 42.3
50	Nunki	76 53.8	−26 21.4
52	Peacock	54 29.8	−56 53.1
21	Pollux	244 21.7	+28 08.3
20	Procyon	245 45.9	+ 5 20.6
46	R'alhague	96 48.0	+12 35.3
26	Regulus	208 30.5	+12 11.4
11	Rigel	281 54.6	− 8 15.2
38	Rigil Kent.	140 52.8	−60 38.8
44	Sabik	103 03.8	−15 40.3
3	Schedar	350 31.8	+56 17.5
45	Shaula	97 22.7	−37 04.3
18	Sirius	259 12.6	−16 39.2
33	Spica	159 18.1	−10 55.5
23	Suhail	223 24.8	−43 14.8
49	Vega	81 09.5	+38 44.2
39	Zub'g'bi	137 54.8	−15 51.2

Lat.	Sunrise	Twlt. begins	Moonrise 25	26	27	28
N °	h m	h m	h m	h m	h m	h m
72	11 50	6 13	0 20	2 32	■	■
70	10 23	6 10	0 05	2 00	4 27	■
68	9 45	6 08	25 37	1 37	3 35	■
66	9 19	6 06	25 19	1 19	3 03	5 02
64	8 58	6 03	25 05	1 05	2 39	4 21
62	8 42	6 01	24 53	0 53	2 21	3 52
60	8 28	5 59	24 43	0 43	2 06	3 31
58	8 17	5 58	24 34	0 34	1 53	3 13
56	8 07	5 55	24 26	0 26	1 42	2 58
54	7 58	5 54	24 19	0 19	1 32	2 46
52	7 50	5 52	24 13	0 13	1 24	2 34
50	7 42	5 50	24 08	0 08	1 16	2 25
45	7 27	5 46	23 56	25 00	1 00	2 04
40	7 14	5 41	23 46	24 46	0 46	1 47
35	7 03	5 36	23 38	24 35	0 35	1 33
30	6 54	5 31	23 30	24 25	0 25	1 21
20	6 37	5 21	23 18	24 08	0 08	1 01
10	6 23	5 10	23 07	23 54	24 43	0 43
0	6 09	4 56	22 57	23 40	24 26	0 26
10	5 55	4 40	22 47	23 27	24 10	0 10
20	5 40	4 19	22 36	23 12	23 52	24 37
30	5 23	3 51	22 24	22 56	23 32	24 14
35	5 13	3 33	22 17	22 47	23 20	24 00
40	5 01	3 09	22 09	22 36	23 07	23 44
45	4 47	2 37	22 00	22 23	22 51	23 26
50	4 31	1 46	21 49	22 08	22 32	23 03
52	4 23	1 08	21 44	22 01	22 23	22 52
54	4 14	////	21 38	21 53	22 13	22 39
56	4 04	////	21 32	21 44	22 01	22 25
58	3 52	////	21 25	21 35	21 48	22 08
60	3 39	////	21 17	21 23	21 32	21 48
S						

Lat.	Sunset	Twlt. ends	Moonset 25	26	27	28
N °	h m	h m	h m	h m	h m	h m
72	12 36	18 15	8 06	7 22	■	■
70	14 03	18 19	8 24	7 55	7 00	■
68	14 41	18 21	8 37	8 20	7 53	■
66	15 07	18 22	8 49	8 39	8 26	8 03
64	15 27	18 24	8 58	8 54	8 50	8 46
62	15 44	18 26	9 07	9 07	9 09	9 15
60	15 57	18 27	9 14	9 18	9 25	9 37
58	16 09	18 30	9 20	9 28	9 39	9 55
56	16 19	18 31	9 26	9 36	9 50	10 10
54	16 28	18 33	9 31	9 44	10 01	10 23
52	16 36	18 35	9 35	9 50	10 10	10 35
50	16 43	18 36	9 39	9 57	10 18	10 45
45	16 59	18 41	9 48	10 10	10 35	11 06
40	17 11	18 45	9 56	10 21	10 50	11 24
35	17 22	18 50	10 02	10 30	11 02	11 38
30	17 32	18 55	10 08	10 39	11 13	11 51
20	17 48	19 04	10 18	10 53	11 31	12 13
10	18 03	19 16	10 27	11 06	11 47	12 32
0	18 16	19 29	10 35	11 17	12 02	12 50
10	18 30	19 45	10 43	11 29	12 17	13 08
20	18 45	20 05	10 52	11 42	12 33	13 27
30	19 02	20 32	11 02	11 57	12 52	13 49
35	19 12	20 50	11 08	12 05	13 03	14 02
40	19 23	21 13	11 15	12 15	13 16	14 17
45	19 37	21 45	11 23	12 26	13 31	14 35
50	19 53	22 34	11 32	12 40	13 49	14 57
52	20 01	23 08	11 37	12 47	13 57	15 08
54	20 10	////	11 42	12 54	14 07	15 20
56	20 20	////	11 47	13 02	14 18	15 34
58	20 31	////	11 53	13 11	14 31	15 50
60	20 44	////	12 00	13 22	14 46	16 10
S						

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.6	0.1	0.1
30			
	0.6	0.1	0.1
45			
	0.6	0.1	0.1
60			
	0.6	0.0	0.0
75			
	0.6	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	25	26	27
°	′	′	′
0			
	12.0	12.1	12.4
4			
	12.0	12.1	12.4
8			
	12.0	12.2	12.4
12			
	12.1	12.2	12.4
16			
	12.1	12.2	12.5
20			
	12.2	12.3	12.6
24			
	12.3	12.4	12.6
28			
	12.4	12.5	12.7
32			
	12.5	12.6	12.8
36			
	12.6	12.7	12.9
40			
	12.7	12.8	13.0
44			
	12.8	12.9	13.1
48			
	13.0	13.1	13.3
52			
	13.1	13.2	13.4
56			
	13.3	13.4	13.5
60			
	13.5	13.5	13.7
64			
	13.6	13.7	13.9
68			
	13.8	13.9	14.0
72			
	14.0	14.1	14.2
76			
	14.2	14.3	14.4
80			
	14.4	14.4	14.5
84			
	14.6	14.6	14.7
88			
	14.7	14.8	14.8
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	25	26	27
°	′	′	′
0			
	17.6	17.5	17.4
4			
	17.6	17.5	17.4
8			
	17.5	17.5	17.3
12			
	17.5	17.4	17.3
16			
	17.5	17.4	17.2
20			
	17.4	17.3	17.2
24			
	17.3	17.2	17.1
28			
	17.2	17.2	17.0
32			
	17.1	17.1	16.9
36			
	17.0	16.9	16.8
40			
	16.9	16.8	16.7
44			
	16.7	16.7	16.6
48			
	16.6	16.6	16.5
52			
	16.4	16.4	16.3
56			
	16.3	16.2	16.2
60			
	16.1	16.1	16.0
64			
	15.9	15.9	15.9
68			
	15.7	15.7	15.7
72			
	15.6	15.6	15.6
76			
	15.4	15.4	15.4
80			
	15.2	15.2	15.2
84			
	15.0	15.0	15.0
88			
	14.8	14.9	14.9
90			

Subtract from table, back cover

Equation of Time (App.—Mean)

GMT	25	26	27
h	m s	m s	m s
0	−12 13.1	−12 27.0	−12 40.1
6	−12 16.7	−12 30.4	−12 43.3
12	−12 20.2	−12 33.7	−12 46.4
18	−12 23.6	−12 36.9	−12 49.4
24	−12 27.0	−12 40.1	−12 52.4

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
25	4 25	12 09	7 00	20 44	6 13
26	5 07	12 10	6 58	20 40	6 09
27	5 51	12 12	6 57	20 36	6 06
28	6 38	12 13	6 55	20 32	6 02

Last Quarter 27

992941°—53——2

GMT	♈ GHA	VENUS −3.5 GHA	VENUS Dec.	MARS 1.3 GHA	MARS Dec.	JUPITER −2.1 GHA	JUPITER Dec.	SATURN 0.8 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
28 0	126 43.4	176 58.6	−19 35.2	256 06.1	−17 28.8	51 06.7	+22 24.1	269 18.9	−12 10.2	263 43.8	122	−21 33.0	−77
1	141 45.8	191 57.8	34.5	271 07.2	29.2	66 09.3	24.1	284 21.2	10.2	278 15.0	120	21 40.7	−76
2	156 48.3	206 57.1	33.8	286 08.2	29.5	81 11.8	24.1	299 23.6	10.2	292 46.0	120	21 48.3	−75
3	171 50.8	221 56.3	•• 33.0	301 09.2	•• 29.9	96 14.4	•• 24.1	314 26.0	•• 10.3	307 17.0	119	•21 55.8	−75
4	186 53.2	236 55.5	32.3	316 10.2	30.3	111 17.0	24.1	329 28.4	10.3	321 47.9	119	22 03.3	−73
5	201 55.7	251 54.7	31.5	331 11.2	30.7	126 19.6	24.1	344 30.7	10.3	336 18.8	117	22 10.6	−72
6	216 58.2	266 54.0	−19 30.8	346 12.2	−17 31.0	141 22.2	+22 24.1	359 33.1	−12 10.3	350 49.5	117	−22 17.8	−72
7	232 00.6	281 53.2	30.1	1 13.2	31.4	156 24.8	24.1	14 35.5	10.3	5 20.2	116	22 25.0	−70
8	247 03.1	296 52.4	29.3	16 14.3	31.8	171 27.4	24.1	29 37.9	10.4	19 50.8	115	22 32.0	−69
9	262 05.6	311 51.7	•• 28.6	31 15.3	•• 32.2	186 29.9	•• 24.1	44 40.3	•• 10.4	34 21.3	114	•22 38.9	−69
10	277 08.0	326 50.9	27.8	46 16.3	32.6	201 32.5	24.1	59 42.6	10.4	48 51.7	114	22 45.8	−67
11	292 10.5	341 50.1	27.1	61 17.3	32.9	216 35.1	24.1	74 45.0	10.4	63 22.1	113	22 52.5	−66
12	307 13.0	356 49.3	−19 26.3	76 18.3	−17 33.3	231 37.7	+22 24.1	89 47.4	−12 10.4	77 52.4	112	−22 59.1	−66
13	322 15.4	11 48.6	25.6	91 19.3	33.7	246 40.3	24.1	104 49.8	10.4	92 22.6	111	23 05.7	−64
14	337 17.9	26 47.8	24.8	106 20.3	34.1	261 42.9	24.1	119 52.1	10.5	106 52.7	110	23 12.1	−63
15	352 20.3	41 47.0	•• 24.1	121 21.4	•• 34.4	276 45.4	•• 24.1	134 54.5	•• 10.5	121 22.7	110	•23 18.4	−62
16	7 22.8	56 46.3	23.3	136 22.4	34.8	291 48.0	24.1	149 56.9	10.5	135 52.7	109	23 24.6	−62
17	22 25.3	71 45.5	22.6	151 23.4	35.2	306 50.6	24.1	164 59.3	10.5	150 22.6	108	23 30.8	−60
18	37 27.7	86 44.7	−19 21.8	166 24.4	−17 35.6	321 53.2	+22 24.1	180 01.7	−12 10.5	164 52.4	107	−23 36.8	−59
19	52 30.2	101 44.0	21.1	181 25.4	35.9	336 55.8	24.1	195 04.0	10.5	179 22.1	107	23 42.7	−57
20	67 32.7	116 43.2	20.3	196 26.4	36.3	351 58.3	24.1	210 06.4	10.6	193 51.8	105	23 48.4	−57
21	82 35.1	131 42.4	•• 19.5	211 27.4	•• 36.7	7 00.9	•• 24.1	225 08.8	•• 10.6	208 21.3	105	•23 54.1	−56
22	97 37.6	146 41.7	18.8	226 28.4	37.1	22 03.5	24.1	240 11.2	10.6	222 50.8	105	23 59.7	−54
23	112 40.1	161 40.9	18.0	241 29.5	37.4	37 06.1	24.1	255 13.6	10.6	237 20.3	103	24 05.1	−54
29 0	127 42.5	176 40.1	−19 17.3	256 30.5	−17 37.8	52 08.7	+22 24.1	270 15.9	−12 10.6	251 49.6	103	−24 10.5	−52
1	142 45.0	191 39.4	16.5	271 31.5	38.2	67 11.2	24.1	285 18.3	10.6	266 18.9	101	24 15.7	−51
2	157 47.5	206 38.6	15.7	286 32.5	38.6	82 13.8	24.1	300 20.7	10.7	280 48.0	102	24 20.8	−50
3	172 49.9	221 37.9	•• 15.0	301 33.5	•• 38.9	97 16.4	•• 24.1	315 23.1	•• 10.7	295 17.2	100	•24 25.8	−48
4	187 52.4	236 37.1	14.2	316 34.5	39.3	112 19.0	24.1	330 25.5	10.7	309 46.2	99	24 30.6	−48
5	202 54.8	251 36.3	13.4	331 35.5	39.7	127 21.5	24.1	345 27.8	10.7	324 15.1	99	24 35.4	−46
6	217 57.3	266 35.6	−19 12.7	346 36.6	−17 40.1	142 24.1	+22 24.1	0 30.2	−12 10.7	338 44.0	98	−24 40.0	−45
7	232 59.8	281 34.8	11.9	1 37.6	40.4	157 26.7	24.1	15 32.6	10.7	353 12.8	98	24 44.5	−44
8	248 02.2	296 34.1	11.1	16 38.6	40.8	172 29.3	24.1	30 35.0	10.8	7 41.6	96	24 48.9	−43
9	263 04.7	311 33.3	•• 10.4	31 39.6	•• 41.2	187 31.8	•• 24.1	45 37.4	•• 10.8	22 10.2	96	•24 53.2	−42
10	278 07.2	326 32.5	09.6	46 40.6	41.6	202 34.4	24.1	60 39.7	10.8	36 38.8	95	24 57.4	−40
11	293 09.6	341 31.8	08.8	61 41.6	41.9	217 37.0	24.1	75 42.1	10.8	51 07.3	95	25 01.4	−39
12	308 12.1	356 31.0	−19 08.1	76 42.6	−17 42.3	232 39.6	+22 24.1	90 44.5	−12 10.8	65 35.8	93	−25 05.3	−38
13	323 14.6	11 30.3	07.3	91 43.7	42.7	247 42.1	24.1	105 46.9	10.8	80 04.1	93	25 09.1	−36
14	338 17.0	26 29.5	06.5	106 44.7	43.0	262 44.7	24.1	120 49.3	10.9	94 32.4	93	25 12.7	−35
15	353 19.5	41 28.8	•• 05.7	121 45.7	•• 43.4	277 47.3	•• 24.1	135 51.7	•• 10.9	109 00.7	91	•25 16.2	−34
16	8 21.9	56 28.0	05.0	136 46.7	43.8	292 49.9	24.1	150 54.0	10.9	123 28.8	91	25 19.6	−33
17	23 24.4	71 27.2	04.2	151 47.7	44.2	307 52.4	24.1	165 56.4	10.9	137 56.9	90	25 22.9	−31
18	38 26.9	86 26.5	−19 03.4	166 48.7	−17 44.5	322 55.0	+22 24.0	180 58.8	−12 10.9	152 24.9	90	−25 26.0	−30
19	53 29.3	101 25.7	02.6	181 49.7	44.9	337 57.6	24.0	196 01.2	10.9	166 52.9	89	25 29.0	−29
20	68 31.8	116 25.0	01.8	196 50.8	45.3	353 00.1	24.0	211 03.6	11.0	181 20.8	88	25 31.9	−27
21	83 34.3	131 24.2	•• 01.1	211 51.8	•• 45.6	8 02.7	•• 24.0	226 06.0	•• 11.0	195 48.6	87	•25 34.6	−27
22	98 36.7	146 23.5	19 00.3	226 52.8	46.0	23 05.3	24.0	241 08.3	11.0	210 16.3	87	25 37.3	−24
23	113 39.2	161 22.7	18 59.5	241 53.8	46.4	38 07.8	24.0	256 10.7	11.0	224 44.0	87	25 39.7	−24
30 0	128 41.7	176 22.0	−18 58.7	256 54.8	−17 46.8	53 10.4	+22 24.0	271 13.1	−12 11.0	239 11.7	85	−25 42.1	−22
1	143 44.1	191 21.2	57.9	271 55.8	47.1	68 13.0	24.0	286 15.5	11.0	253 39.2	85	25 44.3	−20
2	158 46.6	206 20.5	57.1	286 56.8	47.5	83 15.6	24.0	301 17.9	11.0	268 06.7	85	25 46.3	−20
3	173 49.1	221 19.7	•• 56.4	301 57.9	•• 47.9	98 18.1	•• 24.0	316 20.3	•• 11.1	282 34.2	84	•25 48.3	−18
4	188 51.5	236 19.0	55.6	316 58.9	48.2	113 20.7	24.0	331 22.6	11.1	297 01.6	83	25 50.1	−16
5	203 54.0	251 18.2	54.8	331 59.9	48.6	128 23.3	24.0	346 25.0	11.1	311 28.9	83	25 51.7	−15
6	218 56.4	266 17.5	−18 54.0	347 00.9	−17 49.0	143 25.8	+22 24.0	1 27.4	−12 11.1	325 56.2	82	−25 53.2	−14
7	233 58.9	281 16.7	53.2	2 01.9	49.3	158 28.4	24.0	16 29.8	11.1	340 23.4	81	25 54.6	−12
8	249 01.4	296 16.0	52.4	17 02.9	49.7	173 31.0	24.0	31 32.2	11.1	354 50.5	81	25 55.8	−11
9	264 03.8	311 15.2	•• 51.6	32 04.0	•• 50.1	188 33.5	•• 24.0	46 34.6	•• 11.2	9 17.6	81	•25 56.9	−10
10	279 06.3	326 14.5	50.8	47 05.0	50.4	203 36.1	24.0	61 37.0	11.2	23 44.7	80	25 57.9	−8
11	294 08.8	341 13.7	50.0	62 06.0	50.8	218 38.7	24.0	76 39.3	11.2	38 11.7	80	25 58.7	−6
12	309 11.2	356 13.0	−18 49.2	77 07.0	−17 51.2	233 41.2	+22 24.0	91 41.7	−12 11.2	52 38.7	79	−25 59.3	−6
13	324 13.7	11 12.3	48.4	92 08.0	51.5	248 43.8	24.0	106 44.1	11.2	67 05.6	78	25 59.9	−3
14	339 16.2	26 11.5	47.6	107 09.0	51.9	263 46.3	24.0	121 46.5	11.2	81 32.4	78	26 00.2	−3
15	354 18.6	41 10.8	•• 46.8	122 10.0	•• 52.3	278 48.9	•• 24.0	136 48.9	•• 11.2	95 59.2	78	•26 00.5	−1
16	9 21.1	56 10.0	46.0	137 11.1	52.6	293 51.5	24.0	151 51.3	11.3	110 26.0	77	26 00.6	+1
17	24 23.6	71 09.3	45.2	152 12.1	53.0	308 54.0	24.0	166 53.7	11.3	124 52.7	77	26 00.5	+2
18	39 26.0	86 08.5	−18 44.4	167 13.1	−17 53.4	323 56.6	+22 24.0	181 56.0	−12 11.3	139 19.4	76	−26 00.3	+4
19	54 28.5	101 07.8	43.6	182 14.1	53.7	338 59.2	24.0	196 58.4	11.3	153 46.0	76	25 59.9	+5
20	69 30.9	116 07.1	42.8	197 15.1	54.1	354 01.7	24.0	212 00.8	11.3	168 12.6	76	25 59.4	+6
21	84 33.4	131 06.3	•• 42.0	212 16.1	•• 54.5	9 04.3	•• 24.0	227 03.2	•• 11.3	182 39.2	75	•25 58.8	+8
22	99 35.9	146 05.6	41.2	227 17.1	54.8	24 06.8	24.0	242 05.6	11.3	197 05.7	75	25 58.0	+10
23	114 38.3	161 04.8	40.4	242 18.2	55.2	39 09.4	24.0	257 08.0	11.4	211 32.2	74	25 57.0	+11
24	129 40.8	176 04.1	−18 39.6	257 19.2	−17 55.6	54 12.0	+22 24.0	272 10.4	−12 11.4	225 58.6	74	−25 55.9	+12
code	—	−7	+8	+11	−4	+25	0	+24	0				

	GMT	SUN GHA	SUN Dec.
	h	° ′	° ′
28	0	176 46.8	−18 23.6
	1	191 46.7	22.9
	2	206 46.6	22.3
	3	221 46.5	.. 21.6
	4	236 46.3	21.0
	5	251 46.2	20.3
	6	266 46.1	−18 19.7
	7	281 46.0	19.0
	8	296 45.9	18.4
	9	311 45.7	.. 17.7
	10	326 45.6	17.1
	11	341 45.5	16.4
	12	356 45.4	−18 15.7
	13	11 45.3	15.1
	14	26 45.1	14.4
	15	41 45.0	.. 13.8
	16	56 44.9	13.1
	17	71 44.8	12.5
	18	86 44.7	−18 11.8
	19	101 44.5	11.1
	20	116 44.4	10.5
	21	131 44.3	.. 09.8
	22	146 44.2	09.2
	23	161 44.1	08.5
29	0	176 44.0	−18 07.8
	1	191 43.8	07.2
	2	206 43.7	06.5
	3	221 43.6	.. 05.8
	4	236 43.5	05.2
	5	251 43.4	04.5
	6	266 43.3	−18 03.8
	7	281 43.2	03.2
	8	296 43.0	02.5
	9	311 42.9	.. 01.8
	10	326 42.8	01.2
	11	341 42.7	18 00.5
	12	356 42.6	−17 59.8
	13	11 42.5	59.2
	14	26 42.4	58.5
	15	41 42.3	.. 57.8
	16	56 42.2	57.2
	17	71 42.0	56.5
	18	86 41.9	−17 55.8
	19	101 41.8	55.1
	20	116 41.7	54.5
	21	131 41.6	.. 53.8
	22	146 41.5	53.1
	23	161 41.4	52.4
30	0	176 41.3	−17 51.8
	1	191 41.2	51.1
	2	206 41.1	50.4
	3	221 41.0	.. 49.7
	4	236 40.9	49.1
	5	251 40.8	48.4
	6	266 40.6	−17 47.7
	7	281 40.5	47.0
	8	296 40.4	46.3
	9	311 40.3	.. 45.7
	10	326 40.2	45.0
	11	341 40.1	44.3
	12	356 40.0	−17 43.6
	13	11 39.9	42.9
	14	26 39.8	42.2
	15	41 39.7	.. 41.6
	16	56 39.6	40.9
	17	71 39.5	40.2
	18	86 39.4	−17 39.5
	19	101 39.3	38.8
	20	116 39.2	38.1
	21	131 39.1	.. 37.4
	22	146 39.0	36.8
	23	161 38.9	36.1
	24	176 38.8	−17 35.4
	code	—	+ 6

No.	Name	STARS SHA	Dec.
		° ′	° ′
7	Acamar	315 51.9	−40 29.4
5	Achernar	335 59.8	−57 28.4
30	Acrux	173 59.0	−62 50.6
19	Adhara	255 47.2	−28 54.6
10	Aldebaran	291 40.3	+16 25.2
32	Alioth	166 59.2	+56 12.1
34	Alkaid	153 33.7	+49 32.1
55	Al Na'ir	28 39.9	−47 11.1
15	Alnilam	276 31.3	− 1 13.8
25	Alphard	218 39.5	− 8 27.6
41	Alphecca	126 48.7	+26 51.8
1	Alpheratz	358 29.9	+28 50.4
51	Altair	62 52.0	+ 8 44.6
2	Ankaa	353 59.6	−42 33.4
42	Antares	113 21.1	−26 20.0
37	Arcturus	146 36.2	+19 24.9
43	Atria	109 03.3	−68 56.7
22	Avior	234 35.7	−59 21.7
13	Bellatrix	279 19.5	+ 6 18.6
16	Betelg'se	271 49.2	+ 7 24.0
17	Canopus	264 15.5	−52 40.3
12	Capella	281 39.9	+45 57.4
53	Deneb	50 02.4	+45 06.9
28	Denebola	183 18.7	+14 49.5
4	Diphda	349 40.6	−18 14.4
27	Dubhe	194 45.4	+61 59.6
14	Elnath	279 08.6	+28 34.3
47	Eltanin	91 07.2	+51 29.3
54	Enif	34 31.1	+ 9 39.8
56	Fomalhaut	16 13.2	−29 52.0
31	Gacrux	172 50.4	−56 51.3
29	Gienah	176 38.0	−17 17.3
35	Hadar	149 51.2	−60 09.0
6	Hamal	328 51.1	+23 15.0
48	Kaus Aust.	84 43.1	−34 24.5
40	Kochab	137 17.7	+74 20.1
57	Markab	14 23.0	+14 57.5
8	Menkar	315 01.6	+ 3 54.7
36	Menkent	149 00.1	−36 08.7
24	Miapl'dus	221 48.5	−69 31.7
9	Mirfak	309 44.1	+49 42.3
50	Nunki	76 53.7	−26 21.4
52	Peacock	54 29.7	−56 53.1
21	Pollux	244 21.7	+28 08.3
20	Procyon	245 45.9	+ 5 20.6
46	R'alhague	96 48.0	+12 35.3
26	Regulus	208 30.5	+12 11.4
11	Rigel	281 54.6	− 8 15.2
38	Rigil Kent.	140 52.8	−60 38.8
44	Sabik	103 03.8	−15 40.3
3	Schedar	350 31.8	+56 17.5
45	Shaula	97 22.7	−37 04.3
18	Sirius	259 12.6	−16 39.2
33	Spica	159 18.1	−10 55.5
23	Suhail	223 24.8	−43 14.8
49	Vega	81 09.5	+38 44.2
39	Zub'g'bi	137 54.8	−15 51.2

Lat.	Sunrise	Twlt. begins	Moonrise 28	29	30	31
N °	h m	h m	h m	h m	h m	h m
72	11 00	6 04	■	■	■	■
70	10 05	6 03	■	■	■	■
68	9 32	6 02	■	■	■	■
66	9 08	6 00	5 02	■	■	■
64	8 50	5 58	4 21	6 10	■	8 45
62	8 35	5 56	3 52	5 24	6 44	7 35
60	8 22	5 55	3 31	4 54	6 07	7 00
58	8 11	5 53	3 13	4 31	5 41	6 35
56	8 01	5 52	2 58	4 13	5 20	6 14
54	7 53	5 50	2 46	3 57	5 03	5 57
52	7 45	5 49	2 34	3 44	4 48	5 43
50	7 39	5 47	2 25	3 32	4 35	5 30
45	7 24	5 43	2 04	3 08	4 09	5 04
40	7 12	5 39	1 47	2 49	3 48	4 43
35	7 01	5 35	1 33	2 33	3 31	4 26
30	6 52	5 31	1 21	2 19	3 16	4 11
20	6 37	5 21	1 01	1 55	2 50	3 46
10	6 23	5 10	0 43	1 35	2 29	3 24
0	6 10	4 57	0 26	1 16	2 08	3 04
10	5 56	4 41	0 10	0 57	1 48	2 43
20	5 42	4 21	24 37	0 37	1 26	2 21
30	5 25	3 55	24 14	0 14	1 01	1 56
35	5 16	3 37	24 00	0 00	0 47	1 41
40	5 05	3 15	23 44	24 30	0 30	1 24
45	4 52	2 44	23 26	24 09	0 09	1 03
50	4 35	1 57	23 03	23 44	24 37	0 37
52	4 28	1 26	22 52	23 31	24 24	0 24
54	4 19	////	22 39	23 17	24 10	0 10
56	4 10	////	22 25	23 01	23 53	25 03
58	3 59	////	22 08	22 41	23 32	24 44
60	3 47	////	21 48	22 16	23 06	24 22
S						

Lat.	Sunset	Twlt. ends	Moonset 28	29	30	31
N °	h m	h m	h m	h m	h m	h m
72	13 27	18 26	■	■	■	■
70	14 22	18 27	■	■	■	■
68	14 55	18 29	■	■	■	■
66	15 19	18 30	8 03	■	■	■
64	15 37	18 31	8 46	8 40	■	9 53
62	15 52	18 32	9 15	9 27	9 57	11 02
60	16 05	18 34	9 37	9 57	10 34	11 37
58	16 16	18 35	9 55	10 20	11 01	12 02
56	16 26	18 37	10 10	10 39	11 22	12 23
54	16 34	18 38	10 23	10 54	11 39	12 39
52	16 42	18 40	10 35	11 08	11 54	12 54
50	16 48	18 40	10 45	11 20	12 07	13 06
45	17 03	18 45	11 06	11 45	12 33	13 32
40	17 15	18 48	11 24	12 05	12 54	13 52
35	17 25	18 52	11 38	12 21	13 12	14 10
30	17 34	18 56	11 51	12 36	13 27	14 24
20	17 50	19 06	12 13	13 00	13 52	14 49
10	18 04	19 17	12 32	13 21	14 14	15 10
0	18 17	19 29	12 50	13 41	14 35	15 30
10	18 30	19 44	13 08	14 00	14 55	15 50
20	18 44	20 04	13 27	14 22	15 17	16 11
30	19 00	20 30	13 49	14 46	15 42	16 36
35	19 10	20 47	14 02	15 01	15 57	16 50
40	19 21	21 09	14 17	15 17	16 15	17 07
45	19 34	21 39	14 35	15 37	16 35	17 27
50	19 50	22 25	14 57	16 03	17 02	17 52
52	19 57	22 54	15 08	16 15	17 15	18 04
54	20 05	23 54	15 20	16 29	17 29	18 17
56	20 15	////	15 34	16 45	17 46	18 33
58	20 25	////	15 50	17 05	18 07	18 51
60	20 38	////	16 10	17 29	18 32	19 14
S						

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.6	0.1	0.1
30			
	0.6	0.1	0.1
45			
	0.6	0.1	0.1
60			
	0.6	0.0	0.0
75			
	0.6	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	28	29	30
°	′	′	′
0			
	13.0	13.8	14.7
4			
	13.0	13.8	14.7
8			
	13.0	13.8	14.7
12			
	13.1	13.8	14.7
16			
	13.1	13.8	14.7
20			
	13.2	13.9	14.7
24			
	13.2	13.9	14.7
28			
	13.3	14.0	14.8
32			
	13.3	14.0	14.8
36			
	13.4	14.1	14.8
40			
	13.5	14.1	14.8
44			
	13.6	14.2	14.9
48			
	13.7	14.3	14.9
52			
	13.8	14.3	14.9
56			
	13.9	14.4	15.0
60			
	14.1	14.5	15.0
64			
	14.2	14.6	15.1
68			
	14.3	14.7	15.1
72			
	14.5	14.8	15.2
76			
	14.6	14.9	15.2
80			
	14.7	15.0	15.3
84			
	14.9	15.1	15.3
88			
	15.0	15.1	15.3
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	28	29	30
°	′	′	′
0			
	17.0	16.6	16.1
4			
	17.0	16.6	16.1
8			
	17.0	16.5	16.0
12			
	16.9	16.5	16.0
16			
	16.9	16.5	16.0
20			
	16.9	16.5	16.0
24			
	16.8	16.4	16.0
28			
	16.7	16.4	16.0
32			
	16.7	16.3	15.9
36			
	16.6	16.3	15.9
40			
	16.5	16.2	15.9
44			
	16.4	16.1	15.8
48			
	16.3	16.1	15.8
52			
	16.2	16.0	15.8
56			
	16.1	15.9	15.7
60			
	15.9	15.8	15.7
64			
	15.8	15.7	15.6
68			
	15.7	15.6	15.6
72			
	15.6	15.6	15.6
76			
	15.4	15.5	15.5
80			
	15.3	15.4	15.5
84			
	15.1	15.3	15.4
88			
	15.0	15.2	15.4
90			

Subtract from table, back cover

GMT	Equation of Time (App.—Mean) 28	29	30
h	m s	m s	m s
0	−12 52.4	−13 03.9	−13 14.6
6	−12 55.4	−13 06.7	−13 17.2
12	−12 58.3	−13 09.4	−13 19.7
18	−13 01.1	−13 12.0	−13 22.2
24	−13 03.9	−13 14.6	−13 24.6

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
28	6 38	12 13	6 55	20 32	6 02
29	7 28	12 14	6 54	20 28	5 58
30	8 21	12 15	6 52	20 24	5 54
31	9 17	12 16	6 50	20 20	5 50

GMT	♈	VENUS −3.5		MARS 1.2		JUPITER −2.1		SATURN 0.7		MOON			
	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
31 0	129 40.8	176 04.1	−18 39.6	257 19.2	−17 55.6	54 12.0	+22 24.0	272 10.4	−12 11.4	225 58.6	74	−25 55.9	+12
1	144 43.3	191 03.4	38.8	272 20.2	55.9	69 14.5	24.0	287 12.8	11.4	240 25.0	74	25 54.7	+14
2	159 45.7	206 02.6	38.0	287 21.2	56.3	84 17.1	24.0	302 15.1	11.4	254 51.4	73	25 53.3	+16
3	174 48.2	221 01.9	·· 37.2	302 22.2	·· 56.7	99 19.6	·· 24.0	317 17.5	·· 11.4	269 17.7	74	·25 51.7	+17
4	189 50.7	236 01.2	36.4	317 23.2	57.0	114 22.2	24.0	332 19.9	11.4	283 44.1	73	25 50.0	+18
5	204 53.1	251 00.4	35.6	332 24.3	57.4	129 24.8	24.0	347 22.3	11.4	298 10.4	72	25 48.2	+20
6	219 55.6	265 59.7	−18 34.8	347 25.3	−17 57.8	144 27.3	+22 24.0	2 24.7	−12 11.5	312 36.6	73	−25 46.2	+22
7	234 58.1	280 59.0	33.9	2 26.3	58.1	159 29.9	24.0	17 27.1	11.5	327 02.9	72	25 44.0	+23
8	250 00.5	295 58.2	33.1	17 27.3	58.5	174 32.4	24.0	32 29.5	11.5	341 29.1	72	25 41.7	+24
9	265 03.0	310 57.5	·· 32.3	32 28.3	·· 58.8	189 35.0	·· 24.0	47 31.9	·· 11.5	355 55.3	72	·25 39.3	+26
10	280 05.4	325 56.8	31.5	47 29.3	59.2	204 37.5	24.0	62 34.3	11.5	10 21.5	71	25 36.7	+28
11	295 07.9	340 56.0	30.7	62 30.3	59.6	219 40.1	24.0	77 36.7	11.5	24 47.6	72	25 33.9	+29
12	310 10.4	355 55.3	−18 29.9	77 31.4	−17 59.9	234 42.7	+22 24.0	92 39.0	−12 11.5	39 13.8	71	−25 31.0	+31
13	325 12.8	10 54.6	29.1	92 32.4	18 00.3	249 45.2	24.0	107 41.4	11.5	53 39.9	71	25 27.9	+32
14	340 15.3	25 53.8	28.2	107 33.4	00.7	264 47.8	24.0	122 43.8	11.6	68 06.0	71	25 24.7	+34
15	355 17.8	40 53.1	·· 27.4	122 34.4	·· 01.0	279 50.3	·· 24.0	137 46.2	·· 11.6	82 32.1	71	·25 21.3	+35
16	10 20.2	55 52.4	26.6	137 35.4	01.4	294 52.9	24.0	152 48.6	11.6	96 58.2	70	25 17.8	+37
17	25 22.7	70 51.6	25.8	152 36.4	01.7	309 55.4	24.0	167 51.0	11.6	111 24.2	71	25 14.1	+38
18	40 25.2	85 50.9	−18 24.9	167 37.5	−18 02.1	324 58.0	+22 24.0	182 53.4	−12 11.6	125 50.3	71	−25 10.3	+40
19	55 27.6	100 50.2	24.1	182 38.5	02.5	340 00.5	24.0	197 55.8	11.6	140 16.4	70	25 06.3	+42
20	70 30.1	115 49.5	23.3	197 39.5	02.8	355 03.1	24.0	212 58.2	11.6	154 42.4	70	25 02.1	+43
21	85 32.6	130 48.7	·· 22.5	212 40.5	·· 03.2	10 05.6	·· 24.0	228 00.6	·· 11.7	169 08.4	71	·24 57.8	+44
22	100 35.0	145 48.0	21.6	227 41.5	03.5	25 08.2	24.0	243 03.0	11.7	183 34.5	70	24 53.4	+46
23	115 37.5	160 47.3	20.8	242 42.5	03.9	40 10.8	24.0	258 05.3	11.7	198 00.5	71	24 48.8	+48
1 0	130 39.9	175 46.5	−18 20.0	257 43.5	−18 04.3	55 13.3	+22 24.0	273 07.7	−12 11.7	212 26.6	70	−24 44.0	+49
1	145 42.4	190 45.8	19.2	272 44.6	04.6	70 15.9	24.0	288 10.1	11.7	226 52.6	70	24 39.1	+50
2	160 44.9	205 45.1	18.3	287 45.6	05.0	85 18.4	24.0	303 12.5	11.7	241 18.6	71	24 34.1	+53
3	175 47.3	220 44.4	·· 17.5	302 46.6	·· 05.3	100 21.0	·· 24.0	318 14.9	·· 11.7	255 44.7	70	·24 28.8	+53
4	190 49.8	235 43.6	16.7	317 47.6	05.7	115 23.5	24.0	333 17.3	11.7	270 10.7	71	24 23.5	+55
5	205 52.3	250 42.9	15.8	332 48.6	06.1	130 26.1	24.0	348 19.7	11.8	284 36.8	71	24 18.0	+57
6	220 54.7	265 42.2	−18 15.0	347 49.6	−18 06.4	145 28.6	+22 24.0	3 22.1	−12 11.8	299 02.9	70	−24 12.3	+58
7	235 57.2	280 41.5	14.2	2 50.7	06.8	160 31.1	24.0	18 24.5	11.8	313 28.9	71	24 06.5	+60
8	250 59.7	295 40.8	13.3	17 51.7	07.1	175 33.7	24.0	33 26.9	11.8	327 55.0	71	24 00.5	+61
9	266 02.1	310 40.0	·· 12.5	32 52.7	·· 07.5	190 36.2	·· 24.0	48 29.3	·· 11.8	342 21.1	71	·23 54.4	+63
10	281 04.6	325 39.3	11.7	47 53.7	07.8	205 38.8	24.0	63 31.7	11.8	356 47.2	71	23 48.1	+64
11	296 07.0	340 38.6	10.8	62 54.7	08.2	220 41.3	24.0	78 34.1	11.8	11 13.3	72	23 41.7	+66
12	311 09.5	355 37.9	−18 10.0	77 55.7	−18 08.6	235 43.9	+22 24.0	93 36.5	−12 11.8	25 39.5	71	−23 35.1	+67
13	326 12.0	10 37.2	09.1	92 56.8	08.9	250 46.4	24.0	108 38.9	11.9	40 05.6	72	23 28.4	+69
14	341 14.4	25 36.4	08.3	107 57.8	09.3	265 49.0	24.0	123 41.3	11.9	54 31.8	72	23 21.5	+70
15	356 16.9	40 35.7	·· 07.4	122 58.8	·· 09.6	280 51.5	·· 24.0	138 43.6	·· 11.9	68 58.0	72	·23 14.5	+71
16	11 19.4	55 35.0	06.6	137 59.8	10.0	295 54.1	24.0	153 46.0	11.9	83 24.2	72	23 07.4	+73
17	26 21.8	70 34.3	05.8	153 00.8	10.3	310 56.6	24.0	168 48.4	11.9	97 50.4	73	23 00.1	+75
18	41 24.3	85 33.6	−18 04.9	168 01.8	−18 10.7	325 59.2	+22 24.0	183 50.8	−12 11.9	112 16.7	73	−22 52.6	+76
19	56 26.8	100 32.9	04.1	183 02.9	11.1	341 01.7	24.0	198 53.2	11.9	126 43.0	73	22 45.0	+77
20	71 29.2	115 32.1	03.2	198 03.9	11.4	356 04.2	24.0	213 55.6	11.9	141 09.3	73	22 37.3	+79
21	86 31.7	130 31.4	·· 02.4	213 04.9	·· 11.8	11 06.8	·· 24.0	228 58.0	·· 11.9	155 35.6	74	·22 29.4	+81
22	101 34.2	145 30.7	01.5	228 05.9	12.1	26 09.3	24.0	244 00.4	12.0	170 02.0	73	22 21.3	+81
23	116 36.6	160 30.0	18 00.7	243 06.9	12.5	41 11.9	24.0	259 02.8	12.0	184 28.3	75	22 13.2	+83
2 0	131 39.1	175 29.3	−17 59.8	258 07.9	−18 12.8	56 14.4	+22 24.0	274 05.2	−12 12.0	198 54.8	74	−22 04.9	+85
1	146 41.5	190 28.6	59.0	273 09.0	13.2	71 17.0	24.0	289 07.6	12.0	213 21.2	75	21 56.4	+86
2	161 44.0	205 27.9	58.1	288 10.0	13.5	86 19.5	24.0	304 10.0	12.0	227 47.7	75	21 47.8	+87
3	176 46.5	220 27.2	·· 57.3	303 11.0	·· 13.9	101 22.0	·· 24.0	319 12.4	·· 12.0	242 14.2	75	·21 39.1	+89
4	191 48.9	235 26.4	56.4	318 12.0	14.3	116 24.6	24.0	334 14.8	12.0	256 40.7	76	21 30.2	+90
5	206 51.4	250 25.7	55.6	333 13.0	14.6	131 27.1	24.0	349 17.2	12.0	271 07.3	75	21 21.2	+92
6	221 53.9	265 25.0	−17 54.7	348 14.0	−18 15.0	146 29.7	+22 24.0	4 19.6	−12 12.0	285 33.8	77	−21 12.0	+93
7	236 56.3	280 24.3	53.9	3 15.1	15.3	161 32.2	24.0	19 22.0	12.1	300 00.5	76	21 02.7	+94
8	251 58.8	295 23.6	53.0	18 16.1	15.7	176 34.7	24.0	34 24.4	12.1	314 27.1	77	20 53.3	+96
9	267 01.3	310 22.9	·· 52.1	33 17.1	·· 16.0	191 37.3	·· 24.0	49 26.8	·· 12.1	328 53.8	78	·20 43.7	+96
10	282 03.7	325 22.2	51.3	48 18.1	16.4	206 39.8	24.0	64 29.2	12.1	343 20.6	78	20 34.1	+99
11	297 06.2	340 21.5	50.4	63 19.1	16.7	221 42.4	24.0	79 31.6	12.1	357 47.4	78	20 24.2	+99
12	312 08.7	355 20.8	−17 49.6	78 20.1	−18 17.1	236 44.9	+22 24.0	94 34.0	−12 12.1	12 14.2	78	−20 14.3	+101
13	327 11.1	10 20.1	48.7	93 21.2	17.4	251 47.4	24.0	109 36.4	12.1	26 41.0	79	20 04.2	+102
14	342 13.6	25 19.4	47.8	108 22.2	17.8	266 50.0	24.0	124 38.8	12.1	41 07.9	80	19 54.0	+104
15	357 16.0	40 18.7	·· 47.0	123 23.2	·· 18.1	281 52.5	·· 24.0	139 41.2	·· 12.1	55 34.9	79	·19 43.6	+104
16	12 18.5	55 18.0	46.1	138 24.2	18.5	296 55.0	24.0	154 43.6	12.2	70 01.8	80	19 33.2	+106
17	27 21.0	70 17.3	45.2	153 25.2	18.8	311 57.6	24.0	169 46.0	12.2	84 28.8	81	19 22.6	+108
18	42 23.4	85 16.6	−17 44.4	168 26.3	−18 19.2	327 00.1	+22 24.0	184 48.4	−12 12.2	98 55.9	81	−19 11.8	+108
19	57 25.9	100 15.9	43.5	183 27.3	19.5	342 02.6	24.0	199 50.8	12.2	113 23.0	81	19 01.0	+110
20	72 28.4	115 15.1	42.6	198 28.3	19.9	357 05.2	24.0	214 53.2	12.2	127 50.1	82	18 50.0	+111
21	87 30.8	130 14.4	·· 41.8	213 29.3	·· 20.2	12 07.7	·· 24.0	229 55.6	·· 12.2	142 17.3	82	·18 38.9	+112
22	102 33.3	145 13.7	40.9	228 30.3	20.6	27 10.3	24.0	244 58.0	12.2	156 44.5	83	18 27.7	+113
23	117 35.8	160 13.0	40.0	243 31.3	20.9	42 12.8	24.0	260 00.4	12.2	171 11.8	83	18 16.4	+115
24	132 38.2	175 12.3	−17 39.2	258 32.4	−18 21.3	57 15.3	+22 24.0	275 02.8	−12 12.2	185 39.1	83	−18 04.9	+115
code	−	−7	+9	+11	−3	+25	0	+24	−1				

G M T	SUN GHA	SUN Dec.
h	° ′	° ′
31 0	176 38.8	−17 35.4
1	191 38.7	34.7
2	206 38.6	34.0
3	221 38.5	·· 33.3
4	236 38.4	32.6
5	251 38.3	31.9
6	266 38.2	−17 31.2
7	281 38.1	30.5
8	296 38.0	29.8
9	311 37.9	·· 29.1
10	326 37.8	28.5
11	341 37.7	27.8
12	356 37.7	−17 27.1
13	11 37.6	26.4
14	26 37.5	25.7
15	41 37.4	·· 25.0
16	56 37.3	24.3
17	71 37.2	23.6
18	86 37.1	−17 22.9
19	101 37.0	22.2
20	116 36.9	21.5
21	131 36.8	·· 20.8
22	146 36.7	20.1
23	161 36.6	19.4
1 0	176 36.5	−17 18.7
1	191 36.5	18.0
2	206 36.4	17.3
3	221 36.3	·· 16.6
4	236 36.2	15.9
5	251 36.1	15.2
6	266 36.0	−17 14.5
7	281 35.9	13.7
8	296 35.8	13.0
9	311 35.7	·· 12.3
10	326 35.7	11.6
11	341 35.6	10.9
12	356 35.5	−17 10.2
13	11 35.4	09.5
14	26 35.3	08.8
15	41 35.2	·· 08.1
16	56 35.1	07.4
17	71 35.1	06.7
18	86 35.0	−17 05.9
19	101 34.9	05.2
20	116 34.8	04.5
21	131 34.7	·· 03.8
22	146 34.6	03.1
23	161 34.5	02.4
2 0	176 34.5	−17 01.7
1	191 34.4	01.0
2	206 34.3	17 00.2
3	221 34.2	·16 59.5
4	236 34.1	58.8
5	251 34.1	58.1
6	266 34.0	−16 57.4
7	281 33.9	56.6
8	296 33.8	55.9
9	311 33.7	·· 55.2
10	326 33.7	54.5
11	341 33.6	53.8
12	356 33.5	−16 53.0
13	11 33.4	52.3
14	26 33.4	51.6
15	41 33.3	·· 50.9
16	56 33.2	50.2
17	71 33.1	49.4
18	86 33.0	−16 48.7
19	101 33.0	48.0
20	116 32.9	47.3
21	131 32.8	·· 46.5
22	146 32.7	45.8
23	161 32.7	45.1
24	176 32.6	−16 44.4
code	–	+ 7

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.9	−40 29.4
5	Achernar	335 59.8	−57 28.4
30	Acrux	173 58.9	−62 50.6
19	Adhara	255 47.2	−28 54.6
10	Aldebaran	291 40.3	+16 25.2
32	Alioth	166 59.2	+56 12.1
34	Alkaid	153 33.6	+49 32.1
55	Al Na'ir	28 39.8	−47 11.1
15	Alnilam	276 31.3	− 1 13.8
25	Alphard	218 39.5	− 8 27.7
41	Alphecca	126 48.7	+26 51.7
1	Alpheratz	358 29.9	+28 50.4
51	Altair	62 51.9	+ 8 44.6
2	Ankaa	353 59.7	−42 33.4
42	Antares	113 21.0	−26 20.0
37	Arcturus	146 36.2	+19 24.9
43	Atria	109 03.2	−68 56.6
22	Avior	234 35.7	−59 21.8
13	Bellatrix	279 19.5	+ 6 18.6
16	Betelg'se	271 49.2	+ 7 24.0
17	Canopus	264 15.5	−52 40.3
12	Capella	281 39.9	+45 57.4
53	Deneb	50 02.4	+45 06.9
28	Denebola	183 18.7	+14 49.5
4	Diphda	349 40.6	−18 14.4
27	Dubhe	194 45.3	+61 59.7
14	Elnath	279 08.6	+28 34.3
47	Eltanin	91 07.2	+51 29.3
54	Enif	34 31.1	+ 9 39.8
56	Fomalhaut	16 13.2	−29 52.0
31	Gacrux	172 50.4	−56 51.3
29	Gienah	176 37.9	−17 17.4
35	Hadar	149 51.2	−60 09.0
6	Hamal	328 51.1	+23 14.9
48	Kaus Aust.	84 43.1	−34 24.5
40	Kochab	137 17.7	+74 20.1
57	Markab	14 23.0	+14 57.5
8	Menkar	315 01.6	+ 3 54.7
36	Menkent	149 00.1	−36 08.7
24	Miapl'dus	221 48.5	−69 31.7
9	Mirfak	309 44.1	+49 42.3
50	Nunki	76 53.7	−26 21.4
52	Peacock	54 29.7	−56 53.1
21	Pollux	244 21.7	+28 08.3
20	Procyon	245 45.9	+ 5 20.6
46	R'alhague	96 48.0	+12 35.3
26	Regulus	208 30.5	+12 11.4
11	Rigel	281 54.6	− 8 15.2
38	Rigil Kent.	140 52.7	−60 38.8
44	Sabik	103 03.8	−15 40.3
3	Schedar	350 31.8	+56 17.5
45	Shaula	97 22.6	−37 04.3
18	Sirius	259 12.6	−16 39.2
33	Spica	159 18.1	−10 55.5
23	Suhail	223 24.8	−43 14.9
49	Vega	81 09.5	+38 44.2
39	Zub'g'bi	137 54.7	−15 51.3

Lat.	Sunrise	Twlt. begins	Moonrise 31	Moonrise 1	Moonrise 2	Moonrise 3
N °	h m	h m	h m	h m	h m	h m
72	10 31	5 55	■	■	■	10 13
70	9 48	5 54	■	■	■	9 32
68	9 19	5 54	■	■	9 45	9 04
66	8 58	5 52	■	9 56	9 00	8 43
64	8 41	5 52	8 45	8 35	8 30	8 26
62	8 27	5 50	7 35	7 58	8 08	8 12
60	8 15	5 50	7 00	7 32	7 49	8 00
58	8 05	5 49	6 35	7 11	7 34	7 49
56	7 56	5 48	6 14	6 54	7 21	7 40
54	7 48	5 47	5 57	6 39	7 09	7 32
52	7 41	5 45	5 43	6 26	6 59	7 24
50	7 34	5 44	5 30	6 15	6 50	7 18
45	7 21	5 41	5 04	5 51	6 31	7 03
40	7 09	5 37	4 43	5 33	6 15	6 52
35	6 59	5 33	4 26	5 17	6 02	6 41
30	6 51	5 29	4 11	5 03	5 50	6 33
20	6 36	5 20	3 46	4 39	5 30	6 17
10	6 23	5 10	3 24	4 19	5 12	6 04
0	6 10	4 58	3 04	4 00	4 56	5 51
10	5 57	4 43	2 43	3 41	4 40	5 38
20	5 44	4 24	2 21	3 20	4 22	5 24
30	5 28	3 58	1 56	2 57	4 02	5 09
35	5 19	3 41	1 41	2 43	3 50	4 59
40	5 08	3 20	1 24	2 27	3 36	4 49
45	4 56	2 52	1 03	2 07	3 19	4 36
50	4 41	2 08	0 37	1 43	2 59	4 21
52	4 34	1 42	0 24	1 31	2 49	4 14
54	4 26	0 59	0 10	1 18	2 39	4 06
56	4 17	////	25 03	1 03	2 26	3 57
58	4 07	////	24 44	0 44	2 12	3 47
60	3 55	////	24 22	0 22	1 55	3 36
S						

Lat.	Sunset	Twlt. ends	Moonset 31	Moonset 1	Moonset 2	Moonset 3
N °	h m	h m	h m	h m	h m	h m
72	13 58	18 37	■	■	■	14 19
70	14 41	18 37	■	■	■	14 57
68	15 09	18 37	■	■	12 49	15 24
66	15 30	18 37	■	10 39	13 33	15 43
64	15 47	18 38	9 53	12 00	14 02	15 59
62	16 01	18 39	11 02	12 37	14 24	16 12
60	16 13	18 40	11 37	13 03	14 41	16 23
58	16 23	18 41	12 02	13 23	14 56	16 33
56	16 32	18 42	12 23	13 40	15 09	16 41
54	16 40	18 43	12 39	13 55	15 19	16 48
52	16 47	18 44	12 54	14 07	15 29	16 55
50	16 53	18 45	13 06	14 18	15 38	17 01
45	17 07	18 48	13 32	14 41	15 56	17 14
40	17 19	18 52	13 52	14 59	16 10	17 24
35	17 28	18 55	14 10	15 14	16 23	17 33
30	17 37	18 59	14 24	15 27	16 33	17 41
20	17 52	19 08	14 49	15 50	16 52	17 54
10	18 05	19 18	15 10	16 09	17 08	18 05
0	18 17	19 29	15 30	16 27	17 22	18 16
10	18 29	19 43	15 50	16 45	17 37	18 27
20	18 43	20 02	16 11	17 04	17 53	18 38
30	18 58	20 27	16 36	17 26	18 10	18 51
35	19 07	20 43	16 50	17 38	18 21	18 58
40	19 18	21 05	17 07	17 53	18 32	19 06
45	19 30	21 33	17 27	18 10	18 46	19 16
50	19 45	22 14	17 52	18 31	19 02	19 27
52	19 52	22 39	18 04	18 41	19 10	19 33
54	20 00	23 19	18 17	18 53	19 19	19 39
56	20 09	////	18 33	19 06	19 29	19 45
58	20 19	////	18 51	19 21	19 39	19 52
60	20 30	////	19 14	19 38	19 52	20 00
S						

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.6	0.1	0.1
30	0.6	0.1	0.1
45	0.6	0.1	0.1
60	0.6	0.0	0.0
75	0.6	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	31	1	2
°	′	′	′
0	15.7	16.7	17.7
4	15.7	16.7	17.7
8	15.7	16.7	17.7
12	15.7	16.7	17.7
16	15.7	16.7	17.6
20	15.7	16.6	17.6
24	15.7	16.6	17.5
28	15.7	16.6	17.5
32	15.7	16.5	17.4
36	15.7	16.5	17.4
40	15.7	16.5	17.3
44	15.6	16.4	17.2
48	15.6	16.4	17.1
52	15.6	16.3	17.0
56	15.6	16.3	16.9
60	15.6	16.2	16.8
64	15.6	16.2	16.7
68	15.6	16.1	16.6
72	15.6	16.0	16.5
76	15.6	16.0	16.4
80	15.6	15.9	16.3
84	15.6	15.9	16.1
88	15.6	15.8	16.0
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	31	1	2
°	′	′	′
0	15.5	14.9	14.3
4	15.5	14.9	14.3
8	15.5	14.9	14.3
12	15.5	14.9	14.4
16	15.5	14.9	14.4
20	15.5	15.0	14.4
24	15.5	15.0	14.5
28	15.5	15.0	14.5
32	15.5	15.0	14.6
36	15.5	15.1	14.7
40	15.5	15.1	14.8
44	15.5	15.2	14.8
48	15.5	15.2	14.9
52	15.5	15.3	15.0
56	15.5	15.3	15.1
60	15.5	15.4	15.2
64	15.5	15.4	15.3
68	15.5	15.5	15.4
72	15.6	15.5	15.5
76	15.6	15.6	15.7
80	15.6	15.7	15.8
84	15.6	15.7	15.9
88	15.6	15.8	16.0
90			

Subtract from table, back cover

Equation of Time (App.—Mean)

G M T	31	1	2
h	m s	m s	m s
0	−13 24.6	−13 33.7	−13 42.0
6	−13 26.9	−13 35.8	−13 43.9
12	−13 29.2	−13 37.9	−13 45.8
18	−13 31.5	−13 40.0	−13 47.7
24	−13 33.7	−13 42.0	−13 49.5

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
31	9 17	12 16	6 50	20 20	5 50
1	10 13	12 18	6 49	20 16	5 47
2	11 09	12 19	6 47	20 12	5 43
3	12 03	12 20	6 45	20 08	5 39

GMT	♈ GHA	VENUS −3.5 GHA	Dec.	MARS 1.2 GHA	Dec.	JUPITER −2.1 GHA	Dec.	SATURN 0.7 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
3 0	132 38.2	175 12.3	−17 39.2	258 32.4	−18 21.3	57 15.3	+22 24.0	275 02.8	−12 12.2	185 39.1	83	−18 04.9	+115
1	147 40.7	190 11.6	38.3	273 33.4	21.6	72 17.8	24.1	290 05.2	12.2	200 06.4	84	17 53.4	+117
2	162 43.2	205 10.9	37.4	288 34.4	22.0	87 20.4	24.1	305 07.6	12.2	214 33.8	84	17 41.7	+118
3	177 45.6	220 10.3	·· 36.5	303 35.4	·· 22.3	102 22.9	·· 24.1	320 10.0	·· 12.3	229 01.2	85	·17 29.9	+119
4	192 48.1	235 09.6	35.7	318 36.4	22.7	117 25.4	24.1	335 12.4	12.3	243 28.7	85	17 18.0	+120
5	207 50.5	250 08.9	34.8	333 37.4	23.0	132 28.0	24.1	350 14.8	12.3	257 56.2	86	17 06.0	+122
6	222 53.0	265 08.2	−17 33.9	348 38.5	−18 23.4	147 30.5	+22 24.1	5 17.2	−12 12.3	272 23.8	86	−16 53.8	+122
7	237 55.5	280 07.5	33.0	3 39.5	23.7	162 33.0	24.1	20 19.6	12.3	286 51.4	86	16 41.6	+123
8	252 57.9	295 06.8	32.2	18 40.5	24.1	177 35.6	24.1	35 22.0	12.3	301 19.0	87	16 29.3	+125
9	268 00.4	310 06.1	·· 31.3	33 41.5	·· 24.4	192 38.1	·· 24.1	50 24.4	·· 12.3	315 46.7	88	·16 16.8	+126
10	283 02.9	325 05.4	30.4	48 42.5	24.8	207 40.6	24.1	65 26.8	12.3	330 14.5	88	16 04.2	+126
11	298 05.3	340 04.7	29.5	63 43.6	25.1	222 43.2	24.1	80 29.2	12.3	344 42.3	88	15 51.6	+128
12	313 07.8	355 04.0	−17 28.6	78 44.6	−18 25.5	237 45.7	+22 24.1	95 31.6	−12 12.3	359 10.1	89	−15 38.8	+129
13	328 10.3	10 03.3	27.8	93 45.6	25.8	252 48.2	24.1	110 34.0	12.4	13 38.0	89	15 25.9	+129
14	343 12.7	25 02.6	26.9	108 46.6	26.2	267 50.7	24.1	125 36.4	12.4	28 05.9	89	15 13.0	+131
15	358 15.2	40 01.9	·· 26.0	123 47.6	·· 26.5	282 53.3	·· 24.1	140 38.8	·· 12.4	42 33.8	90	·14 59.9	+131
16	13 17.6	55 01.2	25.1	138 48.6	26.9	297 55.8	24.1	155 41.2	12.4	57 01.8	91	14 46.8	+133
17	28 20.1	70 00.5	24.2	153 49.7	27.2	312 58.3	24.1	170 43.6	12.4	71 29.9	91	14 33.5	+133
18	43 22.6	84 59.8	−17 23.3	168 50.7	−18 27.6	328 00.8	+22 24.1	185 46.0	−12 12.4	85 58.0	91	−14 20.2	+135
19	58 25.0	99 59.2	22.4	183 51.7	27.9	343 03.4	24.1	200 48.4	12.4	100 26.1	92	14 06.7	+135
20	73 27.5	114 58.5	21.6	198 52.7	28.3	358 05.9	24.1	215 50.8	12.4	114 54.3	92	13 53.2	+136
21	88 30.0	129 57.8	·· 20.7	213 53.7	·· 28.6	13 08.4	·· 24.1	230 53.2	·· 12.4	129 22.5	92	·13 39.6	+138
22	103 32.4	144 57.1	19.8	228 54.8	28.9	28 10.9	24.1	245 55.6	12.4	143 50.7	93	13 25.8	+137
23	118 34.9	159 56.4	18.9	243 55.8	29.3	43 13.5	24.1	260 58.0	12.4	158 19.0	94	13 12.1	+139
4 0	133 37.4	174 55.7	−17 18.0	258 56.8	−18 29.6	58 16.0	+22 24.1	276 00.4	−12 12.4	172 47.4	93	−12 58.2	+140
1	148 39.8	189 55.0	17.1	273 57.8	30.0	73 18.5	24.1	291 02.8	12.5	187 15.7	95	12 44.2	+140
2	163 42.3	204 54.3	16.2	288 58.8	30.3	88 21.0	24.1	306 05.2	12.5	201 44.2	94	12 30.2	+142
3	178 44.8	219 53.7	·· 15.3	303 59.9	·· 30.7	103 23.6	·· 24.1	321 07.7	·· 12.5	216 12.6	95	·12 16.0	+142
4	193 47.2	234 53.0	14.4	319 00.9	31.0	118 26.1	24.1	336 10.1	12.5	230 41.1	95	12 01.8	+142
5	208 49.7	249 52.3	13.5	334 01.9	31.4	133 28.6	24.1	351 12.5	12.5	245 09.6	96	11 47.6	+144
6	223 52.1	264 51.6	−17 12.6	349 02.9	−18 31.7	148 31.1	+22 24.1	6 14.9	−12 12.5	259 38.2	96	−11 33.2	+144
7	238 54.6	279 50.9	11.7	4 03.9	32.0	163 33.7	24.1	21 17.3	12.5	274 06.8	97	11 18.8	+145
8	253 57.1	294 50.2	10.8	19 04.9	32.4	178 36.2	24.1	36 19.7	12.5	288 35.5	97	11 04.3	+146
9	268 59.5	309 49.6	·· 09.9	34 06.0	·· 32.7	193 38.7	·· 24.1	51 22.1	·· 12.5	303 04.2	97	·10 49.7	+146
10	284 02.0	324 48.9	09.0	49 07.0	33.1	208 41.2	24.1	66 24.5	12.5	317 32.9	98	10 35.1	+148
11	299 04.5	339 48.2	08.1	64 08.0	33.4	223 43.7	24.1	81 26.9	12.5	332 01.7	97	10 20.3	+147
12	314 06.9	354 47.5	−17 07.2	79 09.0	−18 33.8	238 46.3	+22 24.1	96 29.3	−12 12.5	346 30.4	99	−10 05.6	+149
13	329 09.4	9 46.8	06.3	94 10.0	34.1	253 48.8	24.1	111 31.7	12.6	0 59.3	98	9 50.7	+149
14	344 11.9	24 46.2	05.4	109 11.1	34.4	268 51.3	24.1	126 34.1	12.6	15 28.1	99	9 35.8	+149
15	359 14.3	39 45.5	·· 04.5	124 12.1	·· 34.8	283 53.8	·· 24.1	141 36.5	·· 12.6	29 57.0	100	· 9 20.9	+151
16	14 16.8	54 44.8	03.6	139 13.1	35.1	298 56.3	24.1	156 38.9	12.6	44 26.0	99	9 05.8	+150
17	29 19.3	69 44.1	02.7	154 14.1	35.5	313 58.8	24.1	171 41.3	12.6	58 54.9	100	8 50.8	+152
18	44 21.7	84 43.4	−17 01.8	169 15.1	−18 35.8	329 01.4	+22 24.2	186 43.8	−12 12.6	73 23.9	100	− 8 35.6	+152
19	59 24.2	99 42.8	00.9	184 16.2	36.2	344 03.9	24.2	201 46.2	12.6	87 52.9	101	8 20.4	+152
20	74 26.6	114 42.1	17 00.0	199 17.2	36.5	359 06.4	24.2	216 48.6	12.6	102 22.0	101	8 05.2	+153
21	89 29.1	129 41.4	·16 59.1	214 18.2	·· 36.8	14 08.9	·· 24.2	231 51.0	·· 12.6	116 51.1	101	· 7 49.9	+153
22	104 31.6	144 40.7	58.2	229 19.2	37.2	29 11.4	24.2	246 53.4	12.6	131 20.2	101	7 34.6	+154
23	119 34.0	159 40.1	57.3	244 20.2	37.5	44 13.9	24.2	261 55.8	12.6	145 49.3	102	7 19.2	+155
5 0	134 36.5	174 39.4	−16 56.3	259 21.3	−18 37.9	59 16.5	+22 24.2	276 58.2	−12 12.6	160 18.5	102	− 7 03.7	+155
1	149 39.0	189 38.7	55.4	274 22.3	38.2	74 19.0	24.2	292 00.6	12.6	174 47.7	102	6 48.2	+155
2	164 41.4	204 38.0	54.5	289 23.3	38.5	89 21.5	24.2	307 03.0	12.7	189 16.9	102	6 32.7	+155
3	179 43.9	219 37.4	·· 53.6	304 24.3	·· 38.9	104 24.0	·· 24.2	322 05.4	·· 12.7	203 46.1	103	· 6 17.2	+157
4	194 46.4	234 36.7	52.7	319 25.3	39.2	119 26.5	24.2	337 07.8	12.7	218 15.4	102	6 01.5	+156
5	209 48.8	249 36.0	51.8	334 26.4	39.6	134 29.0	24.2	352 10.3	12.7	232 44.6	103	5 45.9	+157
6	224 51.3	264 35.4	−16 50.9	349 27.4	−18 39.9	149 31.5	+22 24.2	7 12.7	−12 12.7	247 13.9	104	− 5 30.2	+157
7	239 53.8	279 34.7	49.9	4 28.4	40.2	164 34.0	24.2	22 15.1	12.7	261 43.3	103	5 14.5	+157
8	254 56.2	294 34.0	49.0	19 29.4	40.6	179 36.6	24.2	37 17.5	12.7	276 12.6	104	4 58.8	+158
9	269 58.7	309 33.4	·· 48.1	34 30.4	·· 40.9	194 39.1	·· 24.2	52 19.9	·· 12.7	290 42.0	104	· 4 43.0	+158
10	285 01.1	324 32.7	47.2	49 31.5	41.2	209 41.6	24.2	67 22.3	12.7	305 11.4	104	4 27.2	+158
11	300 03.6	339 32.0	46.3	64 32.5	41.6	224 44.1	24.2	82 24.7	12.7	319 40.8	104	4 11.4	+159
12	315 06.1	354 31.3	−16 45.3	79 33.5	−18 41.9	239 46.6	+22 24.2	97 27.1	−12 12.7	334 10.2	104	− 3 55.5	+159
13	330 08.5	9 30.7	44.4	94 34.5	42.3	254 49.1	24.2	112 29.5	12.7	348 39.6	104	3 39.6	+159
14	345 11.0	24 30.0	43.5	109 35.5	42.6	269 51.6	24.2	127 31.9	12.7	3 09.0	105	3 23.7	+159
15	0 13.5	39 29.3	·· 42.6	124 36.6	·· 42.9	284 54.1	·· 24.2	142 34.4	·· 12.7	17 38.5	105	· 3 07.8	+160
16	15 15.9	54 28.7	41.6	139 37.6	43.3	299 56.6	24.2	157 36.8	12.7	32 08.0	105	2 51.8	+159
17	30 18.4	69 28.0	40.7	154 38.6	43.6	314 59.1	24.2	172 39.2	12.8	46 37.5	104	2 35.9	+160
18	45 20.9	84 27.4	−16 39.8	169 39.6	−18 43.9	330 01.7	+22 24.2	187 41.6	−12 12.8	61 06.9	106	− 2 19.9	+160
19	60 23.3	99 26.7	38.9	184 40.6	44.3	345 04.2	24.2	202 44.0	12.8	75 36.5	105	2 03.9	+160
20	75 25.8	114 26.0	37.9	199 41.7	44.6	0 06.7	24.2	217 46.4	12.8	90 06.0	105	1 47.9	+160
21	90 28.2	129 25.4	·· 37.0	214 42.7	·· 45.0	15 09.2	·· 24.3	232 48.8	·· 12.8	104 35.5	105	· 1 31.9	+161
22	105 30.7	144 24.7	36.1	229 43.7	45.3	30 11.7	24.3	247 51.2	12.8	119 05.0	105	1 15.8	+160
23	120 33.2	159 24.0	35.1	244 44.7	45.6	45 14.2	24.3	262 53.7	12.8	133 34.5	106	0 59.8	+160
24	135 35.6	174 23.4	−16 34.2	259 45.8	−18 46.0	60 16.7	+22 24.3	277 56.1	−12 12.8	148 04.1	105	− 0 43.8	+161
code	—	− 7	+ 9	+ 10	− 3	+ 25	0	+ 24	− 1				

SUN

Day	GMT h	GHA ° ′	Dec. ° ′
3	0	176 32.6	−16 44.4
	1	191 32.5	43.6
	2	206 32.5	42.9
	3	221 32.4	•• 42.2
	4	236 32.3	41.4
	5	251 32.2	40.7
	6	266 32.2	−16 40.0
	7	281 32.1	39.3
	8	296 32.0	38.5
	9	311 32.0	•• 37.8
	10	326 31.9	37.1
	11	341 31.8	36.3
	12	356 31.7	−16 35.6
	13	11 31.7	34.9
	14	26 31.6	34.1
	15	41 31.5	•• 33.4
	16	56 31.5	32.7
	17	71 31.4	31.9
	18	86 31.3	−16 31.2
	19	101 31.3	30.4
	20	116 31.2	29.7
	21	131 31.1	•• 29.0
	22	146 31.1	28.2
	23	161 31.0	27.5
4	0	176 30.9	−16 26.8
	1	191 30.9	26.0
	2	206 30.8	25.3
	3	221 30.7	•• 24.5
	4	236 30.7	23.8
	5	251 30.6	23.1
	6	266 30.6	−16 22.3
	7	281 30.5	21.6
	8	296 30.4	20.8
	9	311 30.4	•• 20.1
	10	326 30.3	19.3
	11	341 30.2	18.6
	12	356 30.2	−16 17.9
	13	11 30.1	17.1
	14	26 30.1	16.4
	15	41 30.0	•• 15.6
	16	56 29.9	14.9
	17	71 29.9	14.1
	18	86 29.8	−16 13.4
	19	101 29.8	12.6
	20	116 29.7	11.9
	21	131 29.6	•• 11.1
	22	146 29.6	10.4
	23	161 29.5	09.6
5	0	176 29.5	−16 08.9
	1	191 29.4	08.1
	2	206 29.4	07.4
	3	221 29.3	•• 06.6
	4	236 29.3	05.9
	5	251 29.2	05.1
	6	266 29.1	−16 04.4
	7	281 29.1	03.6
	8	296 29.0	02.8
	9	311 29.0	•• 02.1
	10	326 28.9	01.3
	11	341 28.9	16 00.6
	12	356 28.8	−15 59.8
	13	11 28.8	59.1
	14	26 28.7	58.3
	15	41 28.7	•• 57.6
	16	56 28.6	56.8
	17	71 28.6	56.0
	18	86 28.5	−15 55.3
	19	101 28.5	54.5
	20	116 28.4	53.8
	21	131 28.4	•• 53.0
	22	146 28.3	52.2
	23	161 28.3	51.5
	24	176 28.2	−15 50.7
	code	−	+ 8

STARS

No.	Name	SHA ° ′	Dec. ° ′
7	Acamar	315 52.0	−40 29.4
5	Achernar	335 59.8	−57 28.3
30	Acrux	173 58.9	−62 50.6
19	Adhara	255 47.2	−28 54.6
10	Aldebaran	291 40.3	+16 25.2
32	Alioth	166 59.2	+56 12.1
34	Alkaid	153 33.6	+49 32.1
55	Al Na'ir	28 39.8	−47 11.1
15	Alnilam	276 31.3	− 1 13.8
25	Alphard	218 39.5	− 8 27.7
41	Alphecca	126 48.7	+26 51.7
1	Alpheratz	358 29.9	+28 50.4
51	Altair	62 51.9	+ 8 44.6
2	Ankaa	353 59.7	−42 33.4
42	Antares	113 21.0	−26 20.0
37	Arcturus	146 36.2	+19 24.9
43	Atria	109 03.2	−68 56.6
22	Avior	234 35.7	−59 21.8
13	Bellatrix	279 19.5	+ 6 18.6
16	Betelg'se	271 49.2	+ 7 24.0
17	Canopus	264 15.5	−52 40.4
12	Capella	281 40.0	+45 57.4
53	Deneb	50 02.3	+45 06.9
28	Denebola	183 18.7	+14 49.5
4	Diphda	349 40.6	−18 14.4
27	Dubhe	194 45.3	+61 59.7
14	Elnath	279 08.6	+28 34.4
47	Eltanin	91 07.2	+51 29.3
54	Enif	34 31.1	+ 9 39.8
56	Fomalhaut	16 13.2	−29 52.0
31	Gacrux	172 50.4	−56 51.3
29	Gienah	176 37.9	−17 17.4
35	Hadar	149 51.1	−60 09.1
6	Hamal	328 51.1	+23 14.9
48	Kaus Aust.	84 43.1	−34 24.5
40	Kochab	137 17.6	+74 20.1
57	Markab	14 23.0	+14 57.5
8	Menkar	315 01.6	+ 3 54.7
36	Menkent	149 00.1	−36 08.7
24	Miapl'dus	221 48.5	−69 31.7
9	Mirfak	309 44.1	+49 42.3
50	Nunki	76 53.7	−26 21.4
52	Peacock	54 29.7	−56 53.0
21	Pollux	244 21.7	+28 08.3
20	Procyon	245 45.9	+ 5 20.6
46	R'alhague	96 48.0	+12 35.3
26	Regulus	208 30.5	+12 11.4
11	Rigel	281 54.6	− 8 15.2
38	Rigil Kent.	140 52.7	−60 38.8
44	Sabik	103 03.8	−15 40.3
3	Schedar	350 31.8	+56 17.5
45	Shaula	97 22.6	−37 04.3
18	Sirius	259 12.6	−16 39.2
33	Spica	159 18.1	−10 55.5
23	Suhail	223 24.8	−43 14.9
49	Vega	81 09.4	+38 44.2
39	Zub'g'bi	137 54.7	−15 51.3

Lat.	Sunrise	Twlt. begins	Moonrise 3	Moonrise 4	Moonrise 5	Moonrise 6
N °	h m	h m	h m	h m	h m	h m
72	10 07	5 45	10 13	9 14	8 39	8 09
70	9 32	5 45	9 32	8 57	8 32	8 10
68	9 06	5 46	9 04	8 43	8 26	8 12
66	8 47	5 46	8 43	8 31	8 22	8 13
64	8 32	5 45	8 26	8 22	8 18	8 14
62	8 19	5 45	8 12	8 14	8 14	8 15
60	8 08	5 44	8 00	8 06	8 11	8 16
58	7 58	5 44	7 49	8 00	8 09	8 16
56	7 50	5 43	7 40	7 54	8 06	8 17
54	7 43	5 42	7 32	7 49	8 04	8 18
52	7 36	5 42	7 24	7 45	8 02	8 18
50	7 30	5 40	7 18	7 40	8 00	8 19
45	7 17	5 37	7 03	7 31	7 56	8 20
40	7 06	5 34	6 52	7 24	7 53	8 21
35	6 57	5 32	6 41	7 17	7 50	8 21
30	6 49	5 27	6 33	7 11	7 47	8 22
20	6 35	5 20	6 17	7 01	7 43	8 23
10	6 22	5 10	6 04	6 52	7 39	8 24
0	6 10	4 58	5 51	6 44	7 35	8 26
10	5 58	4 44	5 38	6 35	7 31	8 27
20	5 46	4 26	5 24	6 26	7 27	8 28
30	5 31	4 02	5 09	6 16	7 23	8 29
35	5 22	3 46	4 59	6 10	7 20	8 30
40	5 12	3 25	4 49	6 03	7 17	8 31
45	5 00	2 58	4 36	5 55	7 14	8 32
50	4 46	2 18	4 21	5 45	7 10	8 34
52	4 40	1 56	4 14	5 41	7 08	8 34
54	4 32	1 22	4 06	5 36	7 06	8 35
56	4 24	////	3 57	5 30	7 03	8 36
58	4 14	////	3 47	5 24	7 01	8 37
60	4 03	////	3 36	5 17	6 58	8 38
S						

Lat.	Sunset	Twlt. ends	Moonset 3	Moonset 4	Moonset 5	Moonset 6
N °	h m	h m	h m	h m	h m	h m
72	14 22	18 48	14 19	17 09	19 33	21 54
70	14 58	18 47	14 57	17 23	19 36	21 46
68	15 23	18 47	15 24	17 35	19 38	21 40
66	15 42	18 46	15 43	17 44	19 40	21 35
64	15 57	18 46	15 59	17 52	19 42	21 31
62	16 10	18 46	16 12	17 59	19 44	21 28
60	16 21	18 46	16 23	18 05	19 45	21 25
58	16 30	18 46	16 33	18 10	19 46	21 22
56	16 39	18 48	16 41	18 14	19 47	21 19
54	16 46	18 48	16 48	18 18	19 48	21 17
52	16 53	18 49	16 55	18 22	19 49	21 15
50	16 59	18 50	17 01	18 25	19 49	21 13
45	17 12	18 52	17 14	18 32	19 51	21 09
40	17 22	18 54	17 24	18 38	19 52	21 06
35	17 31	18 57	17 33	18 43	19 53	21 03
30	17 39	19 01	17 41	18 48	19 54	21 01
20	17 53	19 08	17 54	18 55	19 56	20 57
10	18 06	19 18	18 05	19 02	19 58	20 53
0	18 17	19 29	18 16	19 08	19 59	20 49
10	18 29	19 43	18 27	19 14	20 00	20 46
20	18 42	20 01	18 38	19 21	20 02	20 42
30	18 56	20 24	18 51	19 28	20 03	20 38
35	19 05	20 40	18 58	19 32	20 04	20 35
40	19 15	21 00	19 06	19 37	20 05	20 33
45	19 26	21 26	19 16	19 42	20 06	20 29
50	19 41	22 05	19 27	19 48	20 07	20 26
52	19 47	22 27	19 33	19 51	20 08	20 24
54	19 54	22 58	19 39	19 54	20 08	20 22
56	20 03	////	19 45	19 58	20 09	20 20
58	20 12	////	19 52	20 02	20 10	20 18
60	20 23	////	20 00	20 06	20 11	20 15
S						

Equation of Time (App.—Mean)

GMT h	3 m s	4 m s	5 m s
0	−13 49.5	−13 56.1	−14 02.0
6	−13 51.2	−13 57.7	−14 03.3
12	−13 52.9	−13 59.2	−14 04.6
18	−13 54.5	−14 00.6	−14 05.8
24	−13 56.1	−14 02.0	−14 07.0

GMT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
3	12 03	12 20	6 45	20 08	5 39
4	12 56	12 21	6 44	20 04	5 35
5	13 47	12 22	6 42	20 00	5 31
6	14 37	12 23	6 41	19 56	5 27

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0			
30	0.6	0.1	0.1
45	0.6	0.1	0.1
60	0.6	0.1	0.1
75	0.6	0.0	0.0
90	0.6	0.0	0.0

Moon's Lower Limb Add

Alt. °	3 ′	4 ′	5 ′
0			
4	18.5	19.1	19.5
8	18.5	19.1	19.5
12	18.4	19.1	19.5
16	18.4	19.0	19.4
20	18.4	19.0	19.3
24	18.3	18.9	19.3
28	18.2	18.8	19.2
32	18.2	18.7	19.1
36	18.1	18.6	19.0
40	18.0	18.5	18.8
44	17.9	18.4	18.7
48	17.8	18.3	18.5
52	17.7	18.1	18.4
56	17.5	18.0	18.2
60	17.4	17.8	18.0
64	17.3	17.6	17.9
68	17.1	17.5	17.7
72	17.0	17.3	17.5
76	16.8	17.1	17.2
80	16.7	16.9	17.0
84	16.5	16.7	16.8
88	16.3	16.5	16.6
90	16.2	16.4	16.4

Add to table, back cover

Moon's Upper Limb Subtract

Alt. °	3 ′	4 ′	5 ′
0			
4	13.9	13.5	13.3
8	13.9	13.5	13.3
12	13.9	13.6	13.3
16	13.9	13.6	13.4
20	14.0	13.6	13.4
24	14.0	13.7	13.5
28	14.1	13.8	13.6
32	14.2	13.9	13.7
36	14.3	14.0	13.8
40	14.4	14.1	14.0
44	14.5	14.2	14.1
48	14.6	14.4	14.2
52	14.7	14.5	14.4
56	14.8	14.7	14.6
60	15.0	14.8	14.8
64	15.1	15.0	14.9
68	15.2	15.2	15.1
72	15.4	15.4	15.3
76	15.5	15.5	15.5
80	15.7	15.7	15.7
84	15.9	15.9	16.0
88	16.0	16.1	16.2
90	16.1	16.3	16.3

Subtract from table, back cover

New Moon 3

G M T	♈ GHA	VENUS −3.5 GHA	Dec.	MARS 1.2 GHA	Dec.	JUPITER −2.1 GHA	Dec.	SATURN 0.7 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
6 0	135 35.6	174 23.4	−16 34.2	259 45.8	−18 46.0	60 16.7	+22 24.3	277 56.1	−12 12.8	148 04.1	105	− 0 43.8	+161
1	150 38.1	189 22.7	33.3	274 46.8	46.3	75 19.2	24.3	292 58.5	12.8	162 33.6	105	0 27.7	+160
2	165 40.6	204 22.1	32.3	289 47.8	46.6	90 21.7	24.3	308 00.9	12.8	177 03.1	106	− 0 11.7	+161
3	180 43.0	219 21.4	·· 31.4	304 48.8	·· 47.0	105 24.2	·· 24.3	323 03.3	·· 12.8	191 32.7	105	+ 0 04.4	+160
4	195 45.5	234 20.7	30.5	319 49.8	47.3	120 26.7	24.3	338 05.7	12.8	206 02.2	106	0 20.4	+160
5	210 48.0	249 20.1	29.5	334 50.9	47.6	135 29.2	24.3	353 08.1	12.8	220 31.8	105	0 36.4	+161
6	225 50.4	264 19.4	−16 28.6	349 51.9	−18 48.0	150 31.7	+22 24.3	8 10.6	−12 12.8	235 01.3	105	+ 0 52.5	+160
7	240 52.9	279 18.8	27.7	4 52.9	48.3	165 34.2	24.3	23 13.0	12.8	249 30.8	106	1 08.5	+160
8	255 55.4	294 18.1	26.7	19 53.9	48.6	180 36.7	24.3	38 15.4	12.8	264 00.4	105	1 24.5	+161
9	270 57.8	309 17.5	·· 25.8	34 54.9	·· 49.0	195 39.2	·· 24.3	53 17.8	·· 12.8	278 29.9	105	· 1 40.6	+160
10	286 00.3	324 16.8	24.9	49 56.0	49.3	210 41.7	24.3	68 20.2	12.8	292 59.4	106	1 56.6	+159
11	301 02.7	339 16.1	23.9	64 57.0	49.6	225 44.2	24.3	83 22.6	12.9	307 29.0	105	2 12.5	+160
12	316 05.2	354 15.5	−16 23.0	79 58.0	−18 50.0	240 46.7	+22 24.3	98 25.0	−12 12.9	321 58.5	105	+ 2 28.5	+160
13	331 07.7	9 14.8	22.0	94 59.0	50.3	255 49.2	24.3	113 27.5	12.9	336 28.0	105	2 44.5	+159
14	346 10.1	24 14.2	21.1	110 00.1	50.6	270 51.7	24.3	128 29.9	12.9	350 57.5	104	3 00.4	+159
15	1 12.6	39 13.5	·· 20.1	125 01.1	·· 51.0	285 54.2	·· 24.3	143 32.3	·· 12.9	5 26.9	105	· 3 16.3	+159
16	16 15.1	54 12.9	19.2	140 02.1	51.3	300 56.7	24.3	158 34.7	12.9	19 56.4	105	3 32.2	+159
17	31 17.5	69 12.2	18.3	155 03.1	51.6	315 59.2	24.3	173 37.1	12.9	34 25.9	104	3 48.1	+159
18	46 20.0	84 11.6	−16 17.3	170 04.1	−18 52.0	331 01.7	+22 24.3	188 39.5	−12 12.9	48 55.3	104	+ 4 04.0	+158
19	61 22.5	99 10.9	16.4	185 05.2	52.3	346 04.2	24.3	203 41.9	12.9	63 24.7	105	4 19.8	+158
20	76 24.9	114 10.3	15.4	200 06.2	52.6	1 06.7	24.4	218 44.4	12.9	77 54.2	104	4 35.6	+158
21	91 27.4	129 09.6	·· 14.5	215 07.2	·· 53.0	16 09.2	·· 24.4	233 46.8	·· 12.9	92 23.6	103	· 4 51.4	+157
22	106 29.8	144 09.0	13.5	230 08.2	53.3	31 11.7	24.4	248 49.2	12.9	106 52.9	104	5 07.1	+157
23	121 32.3	159 08.3	12.6	245 09.3	53.6	46 14.2	24.4	263 51.6	12.9	121 22.3	103	5 22.8	+157
7 0	136 34.8	174 07.7	−16 11.6	260 10.3	−18 53.9	61 16.7	+22 24.4	278 54.0	−12 12.9	135 51.6	104	+ 5 38.5	+156
1	151 37.2	189 07.0	10.7	275 11.3	54.3	76 19.2	24.4	293 56.5	12.9	150 21.0	103	5 54.1	+156
2	166 39.7	204 06.4	09.7	290 12.3	54.6	91 21.7	24.4	308 58.9	12.9	164 50.3	102	6 09.7	+156
3	181 42.2	219 05.7	·· 08.8	305 13.3	·· 54.9	106 24.2	·· 24.4	324 01.3	·· 12.9	179 19.5	103	· 6 25.3	+155
4	196 44.6	234 05.1	07.8	320 14.4	55.3	121 26.7	24.4	339 03.7	12.9	193 48.8	102	6 40.8	+155
5	211 47.1	249 04.4	06.9	335 15.4	55.6	136 29.2	24.4	354 06.1	12.9	208 18.0	102	6 56.3	+154
6	226 49.6	264 03.8	−16 05.9	350 16.4	−18 55.9	151 31.7	+22 24.4	9 08.5	−12 12.9	222 47.2	102	+ 7 11.7	+154
7	241 52.0	279 03.2	04.9	5 17.4	56.3	166 34.2	24.4	24 11.0	12.9	237 16.4	102	7 27.1	+154
8	256 54.5	294 02.5	04.0	20 18.5	56.6	181 36.7	24.4	39 13.4	12.9	251 45.6	101	7 42.5	+153
9	271 57.0	309 01.9	·· 03.0	35 19.5	·· 56.9	196 39.2	·· 24.4	54 15.8	·· 13.0	266 14.7	101	· 7 57.8	+152
10	286 59.4	324 01.2	02.1	50 20.5	57.2	211 41.6	24.4	69 18.2	13.0	280 43.8	100	8 13.0	+152
11	302 01.9	339 00.6	01.1	65 21.5	57.6	226 44.1	24.4	84 20.6	13.0	295 12.8	101	8 28.2	+151
12	317 04.3	353 59.9	−16 00.2	80 22.6	−18 57.9	241 46.6	+22 24.4	99 23.1	−12 13.0	309 41.9	100	+ 8 43.3	+151
13	332 06.8	8 59.3	15 59.2	95 23.6	58.2	256 49.1	24.4	114 25.5	13.0	324 10.9	100	8 58.4	+150
14	347 09.3	23 58.7	58.2	110 24.6	58.5	271 51.6	24.4	129 27.9	13.0	338 39.9	99	9 13.4	+150
15	2 11.7	38 58.0	·· 57.3	125 25.6	·· 58.9	286 54.1	·· 24.5	144 30.3	·· 13.0	353 08.8	99	· 9 28.4	+149
16	17 14.2	53 57.4	56.3	140 26.6	59.2	301 56.6	24.5	159 32.7	13.0	7 37.7	99	9 43.3	+149
17	32 16.7	68 56.7	55.3	155 27.7	59.5	316 59.1	24.5	174 35.2	13.0	22 06.6	98	9 58.2	+147
18	47 19.1	83 56.1	−15 54.4	170 28.7	−18 59.9	332 01.6	+22 24.5	189 37.6	−12 13.0	36 35.4	98	+10 12.9	+148
19	62 21.6	98 55.5	53.4	185 29.7	19 00.2	347 04.1	24.5	204 40.0	13.0	51 04.2	97	10 27.7	+146
20	77 24.1	113 54.8	52.4	200 30.7	00.5	2 06.6	24.5	219 42.4	13.0	65 32.9	98	10 42.3	+146
21	92 26.5	128 54.2	·· 51.5	215 31.8	·· 00.8	17 09.0	·· 24.5	234 44.8	·· 13.0	80 01.7	96	·10 56.9	+145
22	107 29.0	143 53.6	50.5	230 32.8	01.2	32 11.5	24.5	249 47.3	13.0	94 30.3	97	11 11.4	+145
23	122 31.5	158 52.9	49.5	245 33.8	01.5	47 14.0	24.5	264 49.7	13.0	108 59.0	96	11 25.9	+143
8 0	137 33.9	173 52.3	−15 48.6	260 34.8	−19 01.8	62 16.5	+22 24.5	279 52.1	−12 13.0	123 27.6	95	+11 40.2	+144
1	152 36.4	188 51.7	47.6	275 35.9	02.1	77 19.0	24.5	294 54.5	13.0	137 56.1	95	11 54.6	+142
2	167 38.8	203 51.0	46.6	290 36.9	02.5	92 21.5	24.5	309 56.9	13.0	152 24.6	95	12 08.8	+141
3	182 41.3	218 50.4	·· 45.7	305 37.9	·· 02.8	107 24.0	·· 24.5	324 59.4	·· 13.0	166 53.1	94	·12 22.9	+141
4	197 43.8	233 49.7	44.7	320 38.9	03.1	122 26.4	24.5	340 01.8	13.0	181 21.5	94	12 37.0	+140
5	212 46.2	248 49.1	43.7	335 40.0	03.4	137 28.9	24.5	355 04.2	13.0	195 49.9	94	12 51.0	+139
6	227 48.7	263 48.5	−15 42.7	350 41.0	−19 03.8	152 31.4	+22 24.5	10 06.6	−12 13.0	210 18.3	93	+13 04.9	+138
7	242 51.2	278 47.9	41.8	5 42.0	04.1	167 33.9	24.5	25 09.1	13.0	224 46.6	92	13 18.7	+138
8	257 53.6	293 47.2	40.8	20 43.0	04.4	182 36.4	24.6	40 11.5	13.0	239 14.8	92	13 32.5	+136
9	272 56.1	308 46.6	·· 39.8	35 44.1	·· 04.7	197 38.9	·· 24.6	55 13.9	·· 13.0	253 43.0	92	·13 46.1	+136
10	287 58.6	323 46.0	38.8	50 45.1	05.0	212 41.4	24.6	70 16.3	13.0	268 11.2	91	13 59.7	+135
11	303 01.0	338 45.3	37.9	65 46.1	05.4	227 43.8	24.6	85 18.7	13.0	282 39.3	90	14 13.2	+134
12	318 03.5	353 44.7	−15 36.9	80 47.1	−19 05.7	242 46.3	+22 24.6	100 21.2	−12 13.0	297 07.3	90	+14 26.6	+133
13	333 05.9	8 44.1	35.9	95 48.2	06.0	257 48.8	24.6	115 23.6	13.0	311 35.3	90	14 39.9	+132
14	348 08.4	23 43.4	34.9	110 49.2	06.3	272 51.3	24.6	130 26.0	13.0	326 03.3	89	14 53.1	+131
15	3 10.9	38 42.8	·· 34.0	125 50.2	·· 06.7	287 53.8	·· 24.6	145 28.4	·· 13.0	340 31.2	89	·15 06.2	+131
16	18 13.3	53 42.2	33.0	140 51.2	07.0	302 56.2	24.6	160 30.9	13.0	354 59.1	88	15 19.3	+129
17	33 15.8	68 41.6	32.0	155 52.3	07.3	317 58.7	24.6	175 33.3	13.0	9 26.9	87	15 32.2	+128
18	48 18.3	83 40.9	−15 31.0	170 53.3	−19 07.6	333 01.2	+22 24.6	190 35.7	−12 13.0	23 54.6	88	+15 45.0	+127
19	63 20.7	98 40.3	30.0	185 54.3	07.9	348 03.7	24.6	205 38.1	13.0	38 22.4	86	15 57.7	+127
20	78 23.2	113 39.7	29.0	200 55.3	08.3	3 06.2	24.6	220 40.6	13.0	52 50.0	86	16 10.4	+125
21	93 25.7	128 39.1	·· 28.1	215 56.4	·· 08.6	18 08.6	·· 24.6	235 43.0	·· 13.0	67 17.6	86	·16 22.9	+124
22	108 28.1	143 38.4	27.1	230 57.4	08.9	33 11.1	24.6	250 45.4	13.1	81 45.2	85	16 35.3	+123
23	123 30.6	158 37.8	26.1	245 58.4	09.2	48 13.6	24.6	265 47.8	13.1	96 12.7	84	16 47.6	+122
24	138 33.1	173 37.2	−15 25.1	260 59.4	−19 09.6	63 16.1	+22 24.7	280 50.3	−12 13.1	110 40.1	84	+16 59.8	+121
code	—	− 6	+ 10	+ 10	− 3	+ 25	0	+ 24	0				

GMT		SUN GHA	Dec.
d	h	° ′	° ′
6	0	176 28.2	−15 50.7
	1	191 28.2	49.9
	2	206 28.1	49.2
	3	221 28.1	•• 48.4
	4	236 28.0	47.7
	5	251 28.0	46.9
	6	266 27.9	−15 46.1
	7	281 27.9	45.4
	8	296 27.9	44.6
	9	311 27.8	•• 43.8
	10	326 27.8	43.1
	11	341 27.7	42.3
	12	356 27.7	−15 41.5
	13	11 27.6	40.8
	14	26 27.6	40.0
	15	41 27.5	•• 39.2
	16	56 27.5	38.5
	17	71 27.5	37.7
	18	86 27.4	−15 36.9
	19	101 27.4	36.1
	20	116 27.3	35.4
	21	131 27.3	•• 34.6
	22	146 27.3	33.8
	23	161 27.2	33.0
7	0	176 27.2	−15 32.3
	1	191 27.1	31.5
	2	206 27.1	30.7
	3	221 27.1	•• 30.0
	4	236 27.0	29.2
	5	251 27.0	28.4
	6	266 26.9	−15 27.6
	7	281 26.9	26.8
	8	296 26.9	26.1
	9	311 26.8	•• 25.3
	10	326 26.8	24.5
	11	341 26.8	23.7
	12	356 26.7	−15 23.0
	13	11 26.7	22.2
	14	26 26.7	21.4
	15	41 26.6	•• 20.6
	16	56 26.6	19.8
	17	71 26.6	19.1
	18	86 26.5	−15 18.3
	19	101 26.5	17.5
	20	116 26.5	16.7
	21	131 26.4	•• 15.9
	22	146 26.4	15.1
	23	161 26.4	14.4
8	0	176 26.3	−15 13.6
	1	191 26.3	12.8
	2	206 26.3	12.0
	3	221 26.2	•• 11.2
	4	236 26.2	10.4
	5	251 26.2	09.7
	6	266 26.2	−15 08.9
	7	281 26.1	08.1
	8	296 26.1	07.3
	9	311 26.1	•• 06.5
	10	326 26.0	05.7
	11	341 26.0	04.9
	12	356 26.0	−15 04.1
	13	11 26.0	03.3
	14	26 25.9	02.6
	15	41 25.9	•• 01.8
	16	56 25.9	01.0
	17	71 25.9	15 00.2
	18	86 25.8	−14 59.4
	19	101 25.8	58.6
	20	116 25.8	57.8
	21	131 25.8	•• 57.0
	22	146 25.7	56.2
	23	161 25.7	55.4
	24	176 25.7	−14 54.6
code		—	+ 8

STARS No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 52.0	−40 29.4
5	Achernar	335 59.8	−57 28.3
30	Acrux	173 58.9	−62 50.6
19	Adhara	255 47.2	−28 54.6
10	Aldebaran	291 40.3	+16 25.2
32	Alioth	166 59.1	+56 12.1
34	Alkaid	153 33.6	+49 32.1
55	Al Na'ir	28 39.8	−47 11.1
15	Alnilam	276 31.3	− 1 13.8
25	Alphard	218 39.5	− 8 27.7
41	Alphecca	126 48.7	+26 51.7
1	Alpheratz	358 29.9	+28 50.4
51	Altair	62 51.9	+ 8 44.6
2	Ankaa	353 59.7	−42 33.4
42	Antares	113 21.0	−26 20.0
37	Arcturus	146 36.2	+19 24.9
43	Atria	109 03.1	−68 56.6
22	Avior	234 35.7	−59 21.8
13	Bellatrix	279 19.5	+ 6 18.6
16	Betelg'se	271 49.2	+ 7 24.0
17	Canopus	264 15.5	−52 40.4
12	Capella	281 40.0	+45 57.4
53	Deneb	50 02.3	+45 06.9
28	Denebola	183 18.7	+14 49.5
4	Diphda	349 40.6	−18 14.3
27	Dubhe	194 45.3	+61 59.7
14	Elnath	279 08.7	+28 34.4
47	Eltanin	91 07.2	+51 29.3
54	Enif	34 31.1	+ 9 39.8
56	Fomalhaut	16 13.2	−29 52.0
31	Gacrux	172 50.3	−56 51.3
29	Gienah	176 37.9	−17 17.4
35	Hadar	149 51.1	−60 09.1
6	Hamal	328 51.1	+23 14.9
48	Kaus Aust.	84 43.1	−34 24.5
40	Kochab	137 17.5	+74 20.1
57	Markab	14 23.0	+14 57.5
8	Menkar	315 01.6	+ 3 54.7
36	Menkent	149 00.0	−36 08.7
24	Miapl'dus	221 48.5	−69 31.7
9	Mirfak	309 44.1	+49 42.3
50	Nunki	76 53.7	−26 21.4
52	Peacock	54 29.7	−56 53.0
21	Pollux	244 21.7	+28 08.3
20	Procyon	245 45.9	+ 5 20.6
46	R'alhague	96 47.9	+12 35.3
26	Regulus	208 30.5	+12 11.3
11	Rigel	281 54.6	− 8 15.3
38	Rigil Kent.	140 52.6	−60 38.8
44	Sabik	103 03.7	−15 40.3
3	Schedar	350 31.8	+56 17.4
45	Shaula	97 22.6	−37 04.3
18	Sirius	259 12.6	−16 39.2
33	Spica	159 18.0	−10 55.5
23	Suhail	223 24.8	−43 14.9
49	Vega	81 09.4	+38 44.1
39	Zub'g'bi	137 54.7	−15 51.3

Lat.	Sunrise	Twlt. begins	Moonrise 6	7	8	9
N °	h m	h m	h m	h m	h m	h m
72	9 46	5 34	8 09	7 37	6 57	5 15
70	9 16	5 36	8 10	7 48	7 21	6 35
68	8 54	5 37	8 12	7 57	7 39	7 14
66	8 36	5 38	8 13	8 04	7 54	7 42
64	8 22	5 38	8 14	8 10	8 06	8 03
62	8 11	5 38	8 15	8 15	8 17	8 20
60	8 00	5 39	8 16	8 20	8 26	8 34
58	7 52	5 38	8 16	8 24	8 34	8 47
56	7 44	5 38	8 17	8 28	8 41	8 58
54	7 37	5 38	8 18	8 32	8 47	9 07
52	7 31	5 37	8 18	8 35	8 53	9 16
50	7 25	5 36	8 19	8 37	8 58	9 23
45	7 13	5 34	8 20	8 44	9 09	9 40
40	7 03	5 32	8 21	8 49	9 19	9 53
35	6 54	5 29	8 21	8 53	9 27	10 05
30	6 47	5 27	8 22	8 57	9 34	10 15
20	6 34	5 19	8 23	9 04	9 47	10 32
10	6 22	5 10	8 24	9 10	9 58	10 48
0	6 11	5 00	8 26	9 16	10 08	11 02
10	5 59	4 46	8 27	9 22	10 19	11 17
20	5 47	4 29	8 28	9 29	10 30	11 33
30	5 33	4 05	8 29	9 36	10 43	11 51
35	5 25	3 50	8 30	9 40	10 51	12 01
40	5 16	3 30	8 31	9 45	10 59	12 14
45	5 05	3 05	8 32	9 51	11 10	12 28
50	4 51	2 29	8 34	9 58	11 22	12 46
52	4 45	2 07	8 34	10 01	11 28	12 54
54	4 38	1 40	8 35	10 04	11 34	13 04
56	4 30	0 51	8 36	10 08	11 41	13 15
58	4 21	////	8 37	10 13	11 50	13 27
60	4 11	////	8 38	10 18	11 59	13 41
S						

Lat.	Sunset	Twlt. ends	Moonset 6	7	8	9
N °	h m	h m	h m	h m	h m	h m
72	14 44	19 00	21 54	24 24	0 24	3 58
70	15 14	18 57	21 46	24 03	0 03	2 40
68	15 36	18 56	21 40	23 46	26 03	2 03
66	15 53	18 54	21 35	23 33	25 36	1 36
64	16 07	18 54	21 31	23 22	25 16	1 16
62	16 19	18 53	21 28	23 13	25 00	1 00
60	16 29	18 53	21 25	23 05	24 47	0 47
58	16 38	18 53	21 22	22 58	24 35	0 35
56	16 45	18 53	21 19	22 52	24 25	0 25
54	16 52	18 53	21 17	22 47	24 17	0 17
52	16 58	18 53	21 15	22 42	24 09	0 09
50	17 04	18 54	21 13	22 38	24 02	0 02
45	17 16	18 56	21 09	22 28	23 47	25 05
40	17 26	18 58	21 06	22 20	23 35	24 48
35	17 34	19 00	21 03	22 14	23 24	24 35
30	17 42	19 03	21 01	22 08	23 15	24 23
20	17 55	19 10	20 57	21 58	23 00	24 03
10	18 07	19 19	20 53	21 49	22 46	23 45
0	18 18	19 29	20 49	21 41	22 34	23 29
10	18 29	19 42	20 46	21 32	22 21	23 12
20	18 41	19 59	20 42	21 24	22 08	22 55
30	18 54	20 21	20 38	21 14	21 52	22 35
35	19 03	20 37	20 35	21 08	21 44	22 24
40	19 12	20 56	20 33	21 02	21 34	22 10
45	19 23	21 21	20 29	20 54	21 22	21 55
50	19 36	21 56	20 26	20 45	21 08	21 36
52	19 42	22 16	20 24	20 41	21 01	21 26
54	19 49	22 42	20 22	20 37	20 54	21 16
56	19 57	23 26	20 20	20 32	20 46	21 05
58	20 05	////	20 18	20 26	20 37	20 52
60	20 15	////	20 15	20 20	20 27	20 37
S						

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.5	0.1	0.1
30			
	0.5	0.1	0.1
45			
	0.5	0.1	0.1
60			
	0.5	0.0	0.0
75			
	0.5	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	6	7	8
°	′	′	′
0			
	19.5	19.4	19.0
4			
	19.5	19.4	19.0
8			
	19.5	19.3	18.9
12			
	19.4	19.3	18.9
16			
	19.3	19.2	18.9
20			
	19.3	19.2	18.8
24			
	19.2	19.1	18.7
28			
	19.1	19.0	18.6
32			
	19.0	18.9	18.5
36			
	18.8	18.7	18.4
40			
	18.7	18.6	18.3
44			
	18.5	18.5	18.2
48			
	18.4	18.3	18.0
52			
	18.2	18.1	17.9
56			
	18.0	18.0	17.7
60			
	17.9	17.8	17.6
64			
	17.7	17.6	17.4
68			
	17.5	17.4	17.2
72			
	17.2	17.2	17.0
76			
	17.0	17.0	16.8
80			
	16.8	16.8	16.7
84			
	16.6	16.6	16.5
88			
	16.4	16.4	16.3
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	6	7	8
°	′	′	′
0			
	13.3	13.4	13.6
4			
	13.3	13.4	13.6
8			
	13.3	13.4	13.6
12			
	13.4	13.5	13.7
16			
	13.4	13.5	13.7
20			
	13.5	13.6	13.8
24			
	13.6	13.7	13.9
28			
	13.7	13.8	13.9
32			
	13.8	13.9	14.0
36			
	14.0	14.0	14.2
40			
	14.1	14.1	14.3
44			
	14.2	14.3	14.4
48			
	14.4	14.4	14.5
52			
	14.6	14.6	14.7
56			
	14.8	14.8	14.9
60			
	14.9	15.0	15.0
64			
	15.1	15.1	15.2
68			
	15.3	15.3	15.4
72			
	15.5	15.5	15.5
76			
	15.7	15.7	15.7
80			
	16.0	15.9	15.9
84			
	16.2	16.2	16.1
88			
	16.3	16.3	16.2
90			

Subtract from table, back cover

Equation of Time (App.—Mean)

GMT	6	7	8
h	m s	m s	m s
0	−14 07.0	−14 11.2	−14 14.6
6	−14 08.1	−14 12.2	−14 15.3
12	−14 09.2	−14 13.0	−14 16.0
18	−14 10.3	−14 13.9	−14 16.6
24	−14 11.2	−14 14.6	−14 17.2

GMT of Transit
Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
6	14 37	12 23	6 41	19 56	5 27
7	15 28	12 24	6 39	19 52	5 24
8	16 21	12 25	6 37	19 48	5 20
9	17 15	12 26	6 36	19 44	5 16

GMT		♈	VENUS −3.5		MARS 1.0		JUPITER −2.0		SATURN 0.7		MOON			
		GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
9	0	138 33.1	173 37.2	−15 25.1	260 59.4	−19 09.6	63 16.1	+22 24.7	280 50.3	−12 13.1	110 40.1	84	+16 59.8	+121
	1	153 35.5	188 36.6	24.1	276 00.5	09.9	78 18.6	24.7	295 52.7	13.1	125 07.5	83	17 11.9	+120
	2	168 38.0	203 36.0	23.1	291 01.5	10.2	93 21.0	24.7	310 55.1	13.1	139 34.8	83	17 23.9	+119
	3	183 40.4	218 35.3	·· 22.1	306 02.5	·· 10.5	108 23.5	·· 24.7	325 57.6	·· 13.1	154 02.1	82	·17 35.8	+118
	4	198 42.9	233 34.7	21.1	321 03.5	10.8	123 26.0	24.7	341 00.0	13.1	168 29.3	82	17 47.6	+116
	5	213 45.4	248 34.1	20.2	336 04.6	11.1	138 28.5	24.7	356 02.4	13.1	182 56.5	81	17 59.2	+116
	6	228 47.8	263 33.5	−15 19.2	351 05.6	−19 11.5	153 30.9	+22 24.7	11 04.8	−12 13.1	197 23.6	81	+18 10.8	+114
	7	243 50.3	278 32.9	18.2	6 06.6	11.8	168 33.4	24.7	26 07.3	13.1	211 50.7	80	18 22.2	+113
	8	258 52.8	293 32.2	17.2	21 07.6	12.1	183 35.9	24.7	41 09.7	13.1	226 17.7	80	18 33.5	+112
	9	273 55.2	308 31.6	·· 16.2	36 08.7	·· 12.4	198 38.4	·· 24.7	56 12.1	·· 13.1	240 44.7	79	·18 44.7	+111
	10	288 57.7	323 31.0	15.2	51 09.7	12.7	213 40.8	24.7	71 14.5	13.1	255 11.6	79	18 55.8	+109
	11	304 00.2	338 30.4	14.2	66 10.7	13.1	228 43.3	24.7	86 17.0	13.1	269 38.5	78	19 06.7	+109
	12	319 02.6	353 29.8	−15 13.2	81 11.7	−19 13.4	243 45.8	+22 24.7	101 19.4	−12 13.1	284 05.3	77	+19 17.6	+107
	13	334 05.1	8 29.2	12.2	96 12.8	13.7	258 48.3	24.7	116 21.8	13.1	298 32.0	77	19 28.3	+106
	14	349 07.6	23 28.5	11.2	111 13.8	14.0	273 50.7	24.8	131 24.3	13.1	312 58.7	76	19 38.9	+104
	15	4 10.0	38 27.9	·· 10.2	126 14.8	·· 14.3	288 53.2	·· 24.8	146 26.7	·· 13.1	327 25.3	76	·19 49.3	+103
	16	19 12.5	53 27.3	09.2	141 15.9	14.6	303 55.7	24.8	161 29.1	13.1	341 51.9	75	19 59.6	+103
	17	34 14.9	68 26.7	08.2	156 16.9	15.0	318 58.1	24.8	176 31.5	13.1	356 18.4	75	20 09.9	+100
	18	49 17.4	83 26.1	−15 07.2	171 17.9	−19 15.3	334 00.6	+22 24.8	191 34.0	−12 13.1	10 44.9	74	+20 19.9	+100
	19	64 19.9	98 25.5	06.2	186 18.9	15.6	349 03.1	24.8	206 36.4	13.1	25 11.3	74	20 29.9	+ 98
	20	79 22.3	113 24.9	05.2	201 20.0	15.9	4 05.6	24.8	221 38.8	13.1	39 37.7	73	20 39.7	+ 97
	21	94 24.8	128 24.2	·· 04.2	216 21.0	·· 16.2	19 08.0	·· 24.8	236 41.3	·· 13.1	54 04.0	73	·20 49.4	+ 95
	22	109 27.3	143 23.6	03.2	231 22.0	16.5	34 10.5	24.8	251 43.7	13.1	68 30.3	72	20 58.9	+ 94
	23	124 29.7	158 23.0	02.2	246 23.0	16.9	49 13.0	24.8	266 46.1	13.1	82 56.5	72	21 08.3	+ 93
10	0	139 32.2	173 22.4	−15 01.2	261 24.1	−19 17.2	64 15.4	+22 24.8	281 48.5	−12 13.1	97 22.7	71	+21 17.6	+ 92
	1	154 34.7	188 21.8	15 00.2	276 25.1	17.5	79 17.9	24.8	296 51.0	13.1	111 48.8	71	21 26.8	+ 90
	2	169 37.1	203 21.2	14 59.2	291 26.1	17.8	94 20.4	24.8	311 53.4	13.1	126 14.9	70	21 35.8	+ 88
	3	184 39.6	218 20.6	·· 58.2	306 27.1	·· 18.1	109 22.8	·· 24.9	326 55.8	·· 13.1	140 40.9	70	·21 44.6	+ 88
	4	199 42.0	233 20.0	57.2	321 28.2	18.4	124 25.3	24.9	341 58.3	13.1	155 06.9	69	21 53.4	+ 85
	5	214 44.5	248 19.4	56.2	336 29.2	18.7	139 27.8	24.9	357 00.7	13.1	169 32.8	69	22 01.9	+ 85
	6	229 47.0	263 18.8	−14 55.2	351 30.2	−19 19.1	154 30.2	+22 24.9	12 03.1	−12 13.1	183 58.7	68	+22 10.4	+ 83
	7	244 49.4	278 18.2	54.1	6 31.3	19.4	169 32.7	24.9	27 05.6	13.1	198 24.5	68	22 18.7	+ 82
	8	259 51.9	293 17.6	53.1	21 32.3	19.7	184 35.2	24.9	42 08.0	13.1	212 50.3	68	22 26.9	+ 80
	9	274 54.4	308 17.0	·· 52.1	36 33.3	·· 20.0	199 37.6	·· 24.9	57 10.4	·· 13.1	227 16.1	67	·22 34.9	+ 78
	10	289 56.8	323 16.3	51.1	51 34.3	20.3	214 40.1	24.9	72 12.9	13.1	241 41.8	66	22 42.7	+ 78
	11	304 59.3	338 15.7	50.1	66 35.4	20.6	229 42.6	24.9	87 15.3	13.1	256 07.4	66	22 50.5	+ 75
	12	320 01.8	353 15.1	−14 49.1	81 36.4	−19 20.9	244 45.0	+22 24.9	102 17.7	−12 13.1	270 33.0	66	+22 58.0	+ 75
	13	335 04.2	8 14.5	48.1	96 37.4	21.3	259 47.5	24.9	117 20.2	13.1	284 58.6	65	23 05.5	+ 73
	14	350 06.7	23 13.9	47.1	111 38.5	21.6	274 50.0	24.9	132 22.6	13.1	299 24.1	65	23 12.8	+ 71
	15	5 09.2	38 13.3	·· 46.0	126 39.5	·· 21.9	289 52.4	·· 24.9	147 25.0	·· 13.1	313 49.6	65	·23 19.9	+ 70
	16	20 11.6	53 12.7	45.0	141 40.5	22.2	304 54.9	25.0	162 27.4	13.1	328 15.1	64	23 26.9	+ 68
	17	35 14.1	68 12.1	44.0	156 41.5	22.5	319 57.3	25.0	177 29.9	13.1	342 40.5	63	23 33.7	+ 67
	18	50 16.5	83 11.5	−14 43.0	171 42.6	−19 22.8	334 59.8	+22 25.0	192 32.3	−12 13.1	357 05.8	64	+23 40.4	+ 65
	19	65 19.0	98 10.9	42.0	186 43.6	23.1	350 02.3	25.0	207 34.7	13.1	11 31.2	63	23 46.9	+ 64
	20	80 21.5	113 10.3	41.0	201 44.6	23.4	5 04.7	25.0	222 37.2	13.1	25 56.5	63	23 53.3	+ 62
	21	95 23.9	128 09.7	·· 39.9	216 45.7	·· 23.7	20 07.2	·· 25.0	237 39.6	·· 13.1	40 21.8	62	·23 59.5	+ 61
	22	110 26.4	143 09.1	38.9	231 46.7	24.1	35 09.7	25.0	252 42.1	13.1	54 47.0	62	24 05.6	+ 59
	23	125 28.9	158 08.5	37.9	246 47.7	24.4	50 12.1	25.0	267 44.5	13.1	69 12.2	62	24 11.5	+ 58
11	0	140 31.3	173 07.9	−14 36.9	261 48.7	−19 24.7	65 14.6	+22 25.0	282 46.9	−12 13.1	83 37.4	62	+24 17.3	+ 56
	1	155 33.8	188 07.3	35.9	276 49.8	25.0	80 17.0	25.0	297 49.4	13.1	98 02.6	61	24 22.9	+ 54
	2	170 36.3	203 06.7	34.8	291 50.8	25.3	95 19.5	25.0	312 51.8	13.1	112 27.7	61	24 28.3	+ 53
	3	185 38.7	218 06.1	·· 33.8	306 51.8	·· 25.6	110 21.9	·· 25.0	327 54.2	·· 13.1	126 52.8	61	·24 33.6	+ 51
	4	200 41.2	233 05.6	32.8	321 52.9	25.9	125 24.4	25.1	342 56.7	13.1	141 17.9	60	24 38.7	+ 50
	5	215 43.7	248 05.0	31.8	336 53.9	26.2	140 26.9	25.1	357 59.1	13.1	155 42.9	60	24 43.7	+ 48
	6	230 46.1	263 04.4	−14 30.7	351 54.9	−19 26.5	155 29.3	+22 25.1	13 01.5	−12 13.1	170 07.9	60	+24 48.5	+ 47
	7	245 48.6	278 03.8	29.7	6 55.9	26.8	170 31.8	25.1	28 04.0	13.1	184 32.9	60	24 53.2	+ 45
	8	260 51.0	293 03.2	28.7	21 57.0	27.2	185 34.2	25.1	43 06.4	13.1	198 57.9	60	24 57.7	+ 43
	9	275 53.5	308 02.6	·· 27.7	36 58.0	·· 27.5	200 36.7	·· 25.1	58 08.8	·· 13.1	213 22.9	60	·25 02.0	+ 42
	10	290 56.0	323 02.0	26.6	51 59.0	27.8	215 39.1	25.1	73 11.3	13.1	227 47.9	59	25 06.2	+ 40
	11	305 58.4	338 01.4	25.6	67 00.1	28.1	230 41.6	25.1	88 13.7	13.1	242 12.8	59	25 10.2	+ 39
	12	321 00.9	353 00.8	−14 24.6	82 01.1	−19 28.4	245 44.1	+22 25.1	103 16.1	−12 13.1	256 37.7	59	+25 14.1	+ 37
	13	336 03.4	8 00.2	23.5	97 02.1	28.7	260 46.5	25.1	118 18.6	13.0	271 02.6	60	25 17.8	+ 35
	14	351 05.8	22 59.6	22.5	112 03.2	29.0	275 49.0	25.1	133 21.0	13.0	285 27.6	58	25 21.3	+ 34
	15	6 08.3	37 59.0	·· 21.5	127 04.2	·· 29.3	290 51.4	·· 25.1	148 23.5	·· 13.0	299 52.4	59	·25 24.7	+ 32
	16	21 10.8	52 58.5	20.5	142 05.2	29.6	305 53.9	25.2	163 25.9	13.0	314 17.3	59	25 27.9	+ 31
	17	36 13.2	67 57.9	19.4	157 06.2	29.9	320 56.3	25.2	178 28.3	13.0	328 42.2	59	25 31.0	+ 29
	18	51 15.7	82 57.3	−14 18.4	172 07.3	−19 30.2	335 58.8	+22 25.2	193 30.8	−12 13.0	343 07.1	59	+25 33.9	+ 27
	19	66 18.1	97 56.7	17.4	187 08.3	30.5	351 01.2	25.2	208 33.2	13.0	357 32.0	59	25 36.6	+ 26
	20	81 20.6	112 56.1	16.3	202 09.3	30.8	6 03.7	25.2	223 35.6	13.0	11 56.9	58	25 39.2	+ 24
	21	96 23.1	127 55.5	·· 15.3	217 10.4	·· 31.1	21 06.1	·· 25.2	238 38.1	·· 13.0	26 21.7	59	·25 41.6	+ 22
	22	111 25.5	142 54.9	14.2	232 11.4	31.5	36 08.6	25.2	253 40.5	13.0	40 46.6	59	25 43.8	+ 21
	23	126 28.0	157 54.3	13.2	247 12.4	31.8	51 11.0	25.2	268 43.0	13.0	55 11.5	59	25 45.9	+ 19
	24	141 30.5	172 53.8	−14 12.2	262 13.5	−19 32.1	66 13.5	+22 25.2	283 45.4	−12 13.0	69 36.4	59	+25 47.8	+ 18
code		—	− 6	+ 10	+ 10	− 4	+ 25	0	+ 25	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
9 0	176 25.7	−14 54.6
1	191 25.7	53.8
2	206 25.6	53.0
3	221 25.6	•• 52.2
4	236 25.6	51.4
5	251 25.6	50.6
6	266 25.6	−14 49.8
7	281 25.5	49.1
8	296 25.5	48.3
9	311 25.5	•• 47.5
10	326 25.5	46.7
11	341 25.5	45.9
12	356 25.4	−14 45.1
13	11 25.4	44.3
14	26 25.4	43.5
15	41 25.4	•• 42.7
16	56 25.4	41.9
17	71 25.4	41.1
18	86 25.3	−14 40.2
19	101 25.3	39.4
20	116 25.3	38.6
21	131 25.3	•• 37.8
22	146 25.3	37.0
23	161 25.3	36.2
10 0	176 25.3	−14 35.4
1	191 25.2	34.6
2	206 25.2	33.8
3	221 25.2	•• 33.0
4	236 25.2	32.2
5	251 25.2	31.4
6	266 25.2	−14 30.6
7	281 25.2	29.8
8	296 25.1	29.0
9	311 25.1	•• 28.2
10	326 25.1	27.4
11	341 25.1	26.5
12	356 25.1	−14 25.7
13	11 25.1	24.9
14	26 25.1	24.1
15	41 25.1	•• 23.3
16	56 25.1	22.5
17	71 25.1	21.7
18	86 25.1	−14 20.9
19	101 25.0	20.1
20	116 25.0	19.2
21	131 25.0	•• 18.4
22	146 25.0	17.6
23	161 25.0	16.8
11 0	176 25.0	−14 16.0
1	191 25.0	15.2
2	206 25.0	14.4
3	221 25.0	•• 13.5
4	236 25.0	12.7
5	251 25.0	11.9
6	266 25.0	−14 11.1
7	281 25.0	10.3
8	296 25.0	09.4
9	311 25.0	•• 08.6
10	326 25.0	07.8
11	341 25.0	07.0
12	356 25.0	−14 06.2
13	11 25.0	05.4
14	26 25.0	04.5
15	41 25.0	•• 03.7
16	56 25.0	02.9
17	71 25.0	02.1
18	86 25.0	−14 01.2
19	101 25.0	14 00.4
20	116 25.0	13 59.6
21	131 25.0	•• 58.8
22	146 25.0	58.0
23	161 25.0	57.1
24	176 25.0	−13 56.3
code	—	+ 8

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 52.0	−40 29.4
5	Achernar	335 59.9	−57 28.3
30	Acrux	173 58.8	−62 50.7
19	Adhara	255 47.2	−28 54.7
10	Aldebaran	291 40.3	+16 25.2
32	Alioth	166 59.1	+56 12.1
34	Alkaid	153 33.5	+49 32.1
55	Al Na'ir	28 39.8	−47 11.1
15	Alnilam	276 31.3	− 1 13.8
25	Alphard	218 39.5	− 8 27.7
41	Alphecca	126 48.6	+26 51.7
1	Alpheratz	358 29.9	+28 50.4
51	Altair	62 51.9	+ 8 44.6
2	Ankaa	353 59.7	−42 33.4
42	Antares	113 21.0	−26 20.0
37	Arcturus	146 36.1	+19 24.9
43	Atria	109 03.0	−68 56.6
22	Avior	234 35.7	−59 21.8
13	Bellatrix	279 19.5	+ 6 18.6
16	Beteig'se	271 49.2	+ 7 24.0
17	Canopus	264 15.5	−52 40.4
12	Capella	281 40.0	+45 57.4
53	Deneb	50 02.3	+45 06.8
28	Denebola	183 18.7	+14 49.5
4	Diphda	349 40.6	−18 14.3
27	Dubhe	194 45.3	+61 59.7
14	Elnath	279 08.7	+28 34.4
47	Eltanin	91 07.1	+51 29.3
54	Enif	34 31.1	+ 9 39.8
56	Fomalhaut	16 13.2	−29 52.0
31	Gacrux	172 50.3	−56 51.4
29	Gienah	176 37.9	−17 17.4
35	Hadar	149 51.0	−60 09.1
6	Hamal	328 51.1	+23 14.9
48	Kaus Aust.	84 43.0	−34 24.5
40	Kochab	137 17.5	+74 20.1
57	Markab	14 23.0	+14 57.5
8	Menkar	315 01.6	+ 3 54.7
36	Menkent	149 00.0	−36 08.7
24	Miapl'dus	221 48.5	−69 31.8
9	Mirfak	309 44.2	+49 42.3
50	Nunki	76 53.7	−26 21.4
52	Peacock	54 29.7	−56 53.0
21	Pollux	244 21.7	+28 08.3
20	Procyon	245 45.9	+ 5 20.6
46	R'alhague	96 47.9	+12 35.3
26	Regulus	208 30.4	+12 11.3
11	Rigel	281 54.6	− 8 15.3
38	Rigil Kent.	140 52.6	−60 38.8
44	Sabik	103 03.7	−15 40.3
3	Schedar	350 31.8	+56 17.4
45	Shaula	97 22.5	−37 04.3
18	Sirius	259 12.6	−16 39.2
33	Spica	159 18.0	−10 55.5
23	Suhail	223 24.8	−43 14.9
49	Vega	81 09.4	+38 44.1
39	Zub'g'bi	137 54.7	−15 51.3

Lat.	Sunrise	Twlt. begins	Moonrise 9	10	11	12
°	h m	h m	h m	h m	h m	h m
N 72	9 26	5 23	5 15	□	□	□
70	9 01	5 26	6 35	□	□	□
68	8 41	5 28	7 14	□	□	□
66	8 26	5 29	7 42	7 21	□	□
64	8 13	5 31	8 03	8 00	7 58	8 09
62	8 02	5 32	8 20	8 27	8 43	9 21
60	7 53	5 32	8 34	8 48	9 13	9 57
58	7 45	5 33	8 47	9 06	9 36	10 23
56	7 38	5 33	8 58	9 21	9 54	10 43
54	7 31	5 32	9 07	9 33	10 10	11 00
52	7 25	5 32	9 16	9 45	10 24	11 15
50	7 20	5 32	9 23	9 55	10 35	11 27
45	7 09	5 30	9 40	10 16	11 00	11 54
40	7 00	5 29	9 53	10 33	11 20	12 14
35	6 52	5 27	10 05	10 47	11 36	12 32
30	6 45	5 24	10 15	11 00	11 51	12 47
20	6 32	5 18	10 32	11 22	12 15	13 12
10	6 21	5 09	10 48	11 41	12 37	13 34
0	6 11	5 00	11 02	11 58	12 56	13 55
10	6 00	4 47	11 17	12 16	13 16	14 15
20	5 49	4 30	11 33	12 36	13 38	14 37
30	5 36	4 09	11 51	12 58	14 03	15 03
35	5 28	3 54	12 01	13 11	14 17	15 18
40	5 19	3 35	12 14	13 26	14 34	15 35
45	5 09	3 12	12 28	13 44	14 55	15 56
50	4 57	2 38	12 46	14 07	15 21	16 23
52	4 51	2 19	12 54	14 18	15 33	16 35
54	4 44	1 55	13 04	14 30	15 47	16 50
56	4 37	1 20	13 15	14 44	16 04	17 08
58	4 29	////	13 27	15 01	16 24	17 28
S 60	4 20	////	13 41	15 21	16 50	17 55

Lat.	Sunset	Twlt. ends	Moonset 9	10	11	12
°	h m	h m	h m	h m	h m	h m
N 72	15 04	19 11	3 58	□	□	□
70	15 29	19 08	2 40	□	□	□
68	15 49	19 05	2 03	□	□	□
66	16 04	19 03	1 36	3 54	□	□
64	16 17	19 02	1 16	3 16	5 18	7 09
62	16 28	19 01	1 00	2 49	4 33	5 57
60	16 37	19 00	0 47	2 28	4 03	5 21
58	16 45	18 59	0 35	2 11	3 41	4 55
56	16 52	18 59	0 25	1 57	3 23	4 35
54	16 58	18 58	0 17	1 45	3 07	4 18
52	17 04	18 59	0 09	1 34	2 54	4 04
50	17 09	18 59	0 02	1 25	2 43	3 51
45	17 20	18 59	25 05	1 05	2 18	3 25
40	17 29	19 01	24 48	0 48	1 59	3 04
35	17 37	19 03	24 35	0 35	1 43	2 47
30	17 44	19 05	24 23	0 23	1 29	2 32
20	17 57	19 12	24 03	0 03	1 05	2 07
10	18 07	19 19	23 45	24 45	0 45	1 45
0	18 18	19 29	23 29	24 26	0 26	1 24
10	18 28	19 41	23 12	24 07	0 07	1 04
20	18 39	19 56	22 55	23 47	24 42	0 42
30	18 52	20 18	22 35	23 23	24 17	0 17
35	19 00	20 33	22 24	23 09	24 02	0 02
40	19 08	20 50	22 10	22 54	23 44	24 45
45	19 18	21 13	21 55	22 35	23 24	24 22
50	19 31	21 47	21 36	22 11	22 58	23 56
52	19 36	22 04	21 26	22 00	22 45	23 43
54	19 43	22 28	21 16	21 47	22 30	23 28
56	19 50	23 00	21 05	21 33	22 13	23 11
58	19 58	////	20 52	21 16	21 53	22 50
S 60	20 07	////	20 37	20 55	21 27	22 24

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.5	0.1	0.1
30			
	0.5	0.1	0.1
45			
	0.5	0.1	0.1
60			
	0.5	0.0	0.0
75			
	0.5	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	9	10	11
°	′	′	′
0			
	18.5	17.8	17.1
4			
	18.5	17.8	17.1
8			
	18.4	17.8	17.1
12			
	18.4	17.8	17.0
16			
	18.4	17.8	17.0
20			
	18.3	17.7	17.0
24			
	18.2	17.7	17.0
28			
	18.2	17.6	16.9
32			
	18.1	17.5	16.9
36			
	18.0	17.5	16.8
40			
	17.9	17.4	16.8
44			
	17.8	17.3	16.7
48			
	17.7	17.2	16.6
52			
	17.5	17.1	16.6
56			
	17.4	17.0	16.5
60			
	17.3	16.9	16.4
64			
	17.1	16.8	16.4
68			
	17.0	16.7	16.3
72			
	16.8	16.5	16.2
76			
	16.7	16.4	16.1
80			
	16.5	16.3	16.0
84			
	16.3	16.2	16.0
88			
	16.2	16.1	15.9
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	9	10	11
°	′	′	′
0			
	13.9	14.2	14.7
4			
	13.9	14.3	14.7
8			
	13.9	14.3	14.7
12			
	13.9	14.3	14.7
16			
	14.0	14.3	14.7
20			
	14.0	14.4	14.8
24			
	14.1	14.4	14.8
28			
	14.2	14.5	14.8
32			
	14.3	14.5	14.9
36			
	14.4	14.6	14.9
40			
	14.5	14.7	15.0
44			
	14.6	14.8	15.0
48			
	14.7	14.9	15.1
52			
	14.8	15.0	15.2
56			
	15.0	15.1	15.2
60			
	15.1	15.2	15.3
64			
	15.2	15.3	15.4
68			
	15.4	15.4	15.5
72			
	15.5	15.5	15.5
76			
	15.7	15.7	15.6
80			
	15.9	15.8	15.7
84			
	16.0	15.9	15.8
88			
	16.1	16.0	15.9
90			

Subtract from table, back cover

Equation of Time (App.—Mean)

GMT	9	10	11
h	m s	m s	m s
0	−14 17.2	−14 19.0	−14 20.0
6	−14 17.7	−14 19.3	−14 20.1
12	−14 18.2	−14 19.6	−14 20.1
18	−14 18.6	−14 19.8	−14 20.2
24	−14 19.0	−14 20.0	−14 20.1

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
9	17 15	12 26	6 36	19 44	5 16
10	18 12	12 27	6 34	19 40	5 12
11	19 10	12 28	6 32	19 36	5 08
12	20 09	12 29	6 31	19 32	5 04

First Quarter 10

GMT		♈	VENUS −3.5		MARS 1.0		JUPITER −2.0		SATURN 0.7		MOON			
	h	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
		° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
12	0	141 30.5	172 53.8	−14 12.2	262 13.5	−19 32.1	66 13.5	+22 25.2	283 45.4	−12 13.0	69 36.4	59	+25 47.8	+ 18
	1	156 32.9	187 53.2	11.1	277 14.5	32.4	81 15.9	25.2	298 47.8	13.0	84 01.3	59	25 49.6	+ 16
	2	171 35.4	202 52.6	10.1	292 15.5	32.7	96 18.4	25.2	313 50.3	13.0	98 26.2	59	25 51.2	+ 14
	3	186 37.9	217 52.0	·· 09.1	307 16.5	·· 33.0	111 20.8	·· 25.3	328 52.7	·· 13.0	112 51.1	59	·25 52.6	+ 13
	4	201 40.3	232 51.4	08.0	322 17.6	33.3	126 23.3	25.3	343 55.2	13.0	127 16.0	60	25 53.9	+ 11
	5	216 42.8	247 50.8	07.0	337 18.6	33.6	141 25.7	25.3	358 57.6	13.0	141 41.0	59	25 55.0	+ 9
	6	231 45.3	262 50.3	−14 05.9	352 19.6	−19 33.9	156 28.2	+22 25.3	14 00.0	−12 13.0	156 05.9	60	+25 55.9	+ 8
	7	246 47.7	277 49.7	04.9	7 20.7	34.2	171 30.6	25.3	29 02.5	13.0	170 30.9	60	25 56.7	+ 6
	8	261 50.2	292 49.1	03.9	22 21.7	34.5	186 33.1	25.3	44 04.9	13.0	184 55.9	60	25 57.3	+ 5
	9	276 52.6	307 48.5	·· 02.8	37 22.7	·· 34.8	201 35.5	·· 25.3	59 07.3	·· 13.0	199 20.9	60	·25 57.8	+ 3
	10	291 55.1	322 47.9	01.8	52 23.8	35.1	216 38.0	25.3	74 09.8	13.0	213 45.9	61	25 58.1	+ 1
	11	306 57.6	337 47.4	14 00.7	67 24.8	35.4	231 40.4	25.3	89 12.2	13.0	228 11.0	61	25 58.2	0
	12	322 00.0	352 46.8	−13 59.7	82 25.8	−19 35.7	246 42.9	+22 25.3	104 14.7	−12 13.0	242 36.1	61	+25 58.2	− 2
	13	337 02.5	7 46.2	58.6	97 26.9	36.0	261 45.3	25.4	119 17.1	13.0	257 01.2	61	25 58.0	− 3
	14	352 05.0	22 45.6	57.6	112 27.9	36.3	276 47.8	25.4	134 19.6	13.0	271 26.3	62	25 57.7	− 5
	15	7 07.4	37 45.0	·· 56.5	127 28.9	·· 36.6	291 50.2	·· 25.4	149 22.0	·· 13.0	285 51.5	62	·25 57.2	− 6
	16	22 09.9	52 44.5	55.5	142 30.0	36.9	306 52.7	25.4	164 24.4	13.0	300 16.7	62	25 56.6	− 9
	17	37 12.4	67 43.9	54.4	157 31.0	37.2	321 55.1	25.4	179 26.9	13.0	314 41.9	63	25 55.7	− 9
	18	52 14.8	82 43.3	−13 53.4	172 32.0	−19 37.5	336 57.5	+22 25.4	194 29.3	−12 13.0	329 07.2	63	+25 54.8	− 12
	19	67 17.3	97 42.7	52.3	187 33.0	37.8	352 00.0	25.4	209 31.8	13.0	343 32.5	64	25 53.6	− 12
	20	82 19.8	112 42.2	51.3	202 34.1	38.1	7 02.4	25.4	224 34.2	13.0	357 57.9	64	25 52.4	− 15
	21	97 22.2	127 41.6	·· 50.2	217 35.1	·· 38.4	22 04.9	·· 25.4	239 36.6	·· 13.0	12 23.3	64	·25 50.9	− 16
	22	112 24.7	142 41.0	49.2	232 36.1	38.7	37 07.3	25.4	254 39.1	13.0	26 48.7	64	25 49.3	− 17
	23	127 27.1	157 40.4	48.1	247 37.2	39.0	52 09.8	25.5	269 41.5	13.0	41 14.1	66	25 47.6	− 19
13	0	142 29.6	172 39.9	−13 47.1	262 38.2	−19 39.3	67 12.2	+22 25.5	284 44.0	−12 12.9	55 39.7	65	+25 45.7	− 21
	1	157 32.1	187 39.3	46.0	277 39.2	39.6	82 14.6	25.5	299 46.4	12.9	70 05.2	66	25 43.6	− 22
	2	172 34.5	202 38.7	45.0	292 40.3	39.9	97 17.1	25.5	314 48.9	12.9	84 30.8	67	25 41.4	− 24
	3	187 37.0	217 38.1	·· 43.9	307 41.3	·· 40.2	112 19.5	·· 25.5	329 51.3	·· 12.9	98 56.5	67	·25 39.0	− 25
	4	202 39.5	232 37.6	42.9	322 42.3	40.5	127 22.0	25.5	344 53.7	12.9	113 22.2	67	25 36.5	− 26
	5	217 41.9	247 37.0	41.8	337 43.4	40.8	142 24.4	25.5	359 56.2	12.9	127 47.9	69	25 33.9	− 29
	6	232 44.4	262 36.4	−13 40.7	352 44.4	−19 41.1	157 26.8	+22 25.5	14 58.6	−12 12.9	142 13.8	68	+25 31.0	− 29
	7	247 46.9	277 35.9	39.7	7 45.4	41.4	172 29.3	25.5	30 01.1	12.9	156 39.6	69	25 28.1	− 31
	8	262 49.3	292 35.3	38.6	22 46.5	41.7	187 31.7	25.5	45 03.5	12.9	171 05.5	70	25 25.0	− 33
	9	277 51.8	307 34.7	·· 37.6	37 47.5	·· 42.0	202 34.2	·· 25.6	60 06.0	·· 12.9	185 31.5	70	·25 21.7	− 34
	10	292 54.3	322 34.2	36.5	52 48.5	42.3	217 36.6	25.6	75 08.4	12.9	199 57.5	71	25 18.3	− 36
	11	307 56.7	337 33.6	35.5	67 49.6	42.6	232 39.0	25.6	90 10.9	12.9	214 23.6	72	25 14.7	− 37
	12	322 59.2	352 33.0	−13 34.4	82 50.6	−19 42.9	247 41.5	+22 25.6	105 13.3	−12 12.9	228 49.8	72	+25 11.0	− 38
	13	338 01.6	7 32.5	33.3	97 51.6	43.2	262 43.9	25.6	120 15.7	12.9	243 16.0	73	25 07.2	− 40
	14	353 04.1	22 31.9	32.3	112 52.7	43.5	277 46.3	25.6	135 18.2	12.9	257 42.3	73	25 03.2	− 41
	15	8 06.6	37 31.3	·· 31.2	127 53.7	·· 43.8	292 48.8	·· 25.6	150 20.6	·· 12.9	272 08.6	74	·24 59.1	− 43
	16	23 09.0	52 30.8	30.1	142 54.7	44.1	307 51.2	25.6	165 23.1	12.9	286 35.0	75	24 54.8	− 44
	17	38 11.5	67 30.2	29.1	157 55.8	44.4	322 53.6	25.6	180 25.5	12.9	301 01.5	75	24 50.4	− 46
	18	53 14.0	82 29.6	−13 28.0	172 56.8	−19 44.7	337 56.1	+22 25.6	195 28.0	−12 12.9	315 28.0	77	+24 45.8	− 47
	19	68 16.4	97 29.1	27.0	187 57.8	45.0	352 58.5	25.7	210 30.4	12.9	329 54.7	76	24 41.1	− 48
	20	83 18.9	112 28.5	25.9	202 58.9	45.3	8 00.9	25.7	225 32.9	12.9	344 21.3	78	24 36.3	− 50
	21	98 21.4	127 27.9	·· 24.8	217 59.9	·· 45.6	23 03.4	·· 25.7	240 35.3	·· 12.9	·358 48.1	78	·24 31.3	− 51
	22	113 23.8	142 27.4	23.8	233 00.9	45.9	38 05.8	25.7	255 37.8	12.8	13 14.9	79	24 26.2	− 53
	23	128 26.3	157 26.8	22.7	248 02.0	46.2	53 08.2	25.7	270 40.2	12.8	27 41.8	80	24 20.9	− 53
14	0	143 28.8	172 26.3	−13 21.6	263 03.0	−19 46.5	68 10.7	+22 25.7	285 42.7	−12 12.8	42 08.8	80	+24 15.6	− 55
	1	158 31.2	187 25.7	20.5	278 04.0	46.8	83 13.1	25.7	300 45.1	12.8	56 35.8	81	24 10.1	− 57
	2	173 33.7	202 25.1	19.5	293 05.1	47.1	98 15.5	25.7	315 47.5	12.8	71 02.9	82	24 04.4	− 58
	3	188 36.1	217 24.6	·· 18.4	308 06.1	·· 47.4	113 18.0	·· 25.7	330 50.0	·· 12.8	85 30.1	83	·23 58.6	− 59
	4	203 38.6	232 24.0	17.3	323 07.1	47.7	128 20.4	25.8	345 52.4	12.8	99 57.4	83	23 52.7	− 60
	5	218 41.1	247 23.5	16.3	338 08.2	47.9	143 22.8	25.8	0 54.9	12.8	114 24.7	84	23 46.7	− 62
	6	233 43.5	262 22.9	−13 15.2	353 09.2	−19 48.2	158 25.3	+22 25.8	15 57.3	−12 12.8	128 52.1	85	+23 40.5	− 63
	7	248 46.0	277 22.3	14.1	8 10.2	48.5	173 27.7	25.8	30 59.8	12.8	143 19.6	86	23 34.2	− 64
	8	263 48.5	292 21.8	13.0	23 11.3	48.8	188 30.1	25.8	46 02.2	12.8	157 47.2	87	23 27.8	− 65
	9	278 50.9	307 21.2	·· 12.0	38 12.3	·· 49.1	203 32.6	·· 25.8	61 04.7	·· 12.8	172 14.9	87	·23 21.3	− 67
	10	293 53.4	322 20.7	10.9	53 13.4	49.4	218 35.0	25.8	76 07.1	12.8	186 42.6	88	23 14.6	− 68
	11	308 55.9	337 20.1	09.8	68 14.4	49.7	233 37.4	25.8	91 09.6	12.8	201 10.4	89	23 07.8	− 69
	12	323 58.3	352 19.6	−13 08.7	83 15.4	−19 50.0	248 39.8	+22 25.8	106 12.0	−12 12.8	215 38.3	90	+23 00.9	− 70
	13	339 00.8	7 19.0	07.7	98 16.5	50.3	263 42.3	25.9	121 14.5	12.8	230 06.3	91	22 53.9	− 71
	14	354 03.2	22 18.5	06.6	113 17.5	50.6	278 44.7	25.9	136 16.9	12.8	244 34.4	91	22 46.8	− 73
	15	9 05.7	37 17.9	·· 05.5	128 18.5	·· 50.9	293 47.1	·· 25.9	151 19.4	·· 12.8	259 02.5	92	·22 39.5	− 74
	16	24 08.2	52 17.3	04.4	143 19.6	51.2	308 49.5	25.9	166 21.8	12.7	273 30.7	94	22 32.1	− 75
	17	39 10.6	67 16.8	03.4	158 20.6	51.5	323 52.0	25.9	181 24.3	12.7	287 59.1	94	22 24.6	− 76
	18	54 13.1	82 16.2	−13 02.3	173 21.6	−19 51.8	338 54.4	+22 25.9	196 26.7	−12 12.7	302 27.5	94	+22 17.0	− 77
	19	69 15.6	97 15.7	01.2	188 22.7	52.0	353 56.8	25.9	211 29.2	12.7	316 55.9	96	22 09.3	− 78
	20	84 18.0	112 15.1	13 00.1	203 23.7	52.3	8 59.3	25.9	226 31.6	12.7	331 24.5	97	22 01.5	− 80
	21	99 20.5	127 14.6	·12 59.0	218 24.7	·· 52.6	24 01.7	·· 25.9	241 34.1	·· 12.7	345 53.2	97	·21 53.5	− 80
	22	114 23.0	142 14.0	58.0	233 25.8	52.9	39 04.1	26.0	256 36.5	12.7	0 21.9	98	21 45.5	− 82
	23	129 25.4	157 13.5	56.9	248 26.8	53.2	54 06.5	26.0	271 39.0	12.7	14 50.7	99	21 37.3	− 83
	24	144 27.9	172 12.9	−12 55.8	263 27.9	−19 53.5	69 08.9	+22 26.0	286 41.4	−12 12.7	29 19.6	100	+21 29.0	− 83
code		—	− 5	+ 11	+ 10	− 3	+ 24	0	+ 24	0				

GMT (h)	SUN GHA	SUN Dec.
12 0	176 25.0	−13 56.3
1	191 25.0	55.5
2	206 25.0	54.7
3	221 25.0	•• 53.8
4	236 25.0	53.0
5	251 25.0	52.2
6	266 25.0	−13 51.3
7	281 25.0	50.5
8	296 25.0	49.7
9	311 25.0	•• 48.9
10	326 25.0	48.0
11	341 25.0	47.2
12	356 25.0	−13 46.4
13	11 25.0	45.5
14	26 25.0	44.7
15	41 25.0	•• 43.9
16	56 25.1	43.1
17	71 25.1	42.2
18	86 25.1	−13 41.4
19	101 25.1	40.6
20	116 25.1	39.7
21	131 25.1	•• 38.9
22	146 25.1	38.1
23	161 25.1	37.2
13 0	176 25.1	−13 36.4
1	191 25.1	35.6
2	206 25.1	34.7
3	221 25.2	•• 33.9
4	236 25.2	33.1
5	251 25.2	32.2
6	266 25.2	−13 31.4
7	281 25.2	30.5
8	296 25.2	29.7
9	311 25.2	•• 28.9
10	326 25.2	28.0
11	341 25.3	27.2
12	356 25.3	−13 26.4
13	11 25.3	25.5
14	26 25.3	24.7
15	41 25.3	•• 23.8
16	56 25.3	23.0
17	71 25.4	22.2
18	86 25.4	−13 21.3
19	101 25.4	20.5
20	116 25.4	19.6
21	131 25.4	•• 18.8
22	146 25.4	18.0
23	161 25.5	17.1
14 0	176 25.5	−13 16.3
1	191 25.5	15.4
2	206 25.5	14.6
3	221 25.5	•• 13.7
4	236 25.6	12.9
5	251 25.6	12.0
6	266 25.6	−13 11.2
7	281 25.6	10.4
8	296 25.6	09.5
9	311 25.7	•• 08.7
10	326 25.7	07.8
11	341 25.7	07.0
12	356 25.7	−13 06.1
13	11 25.7	05.3
14	26 25.8	04.4
15	41 25.8	•• 03.6
16	56 25.8	02.7
17	71 25.8	01.9
18	86 25.9	−13 01.0
19	101 25.9	13 00.2
20	116 25.9	12 59.3
21	131 25.9	58.5
22	146 26.0	•• 57.6
23	161 26.0	56.8
24	176 26.0	−12 55.9
code	—	+ 9

No.	STARS Name	SHA	Dec.
7	Acamar	315 52.0	−40 29.4
5	Achernar	335 59.9	−57 28.3
30	Acrux	173 58.8	−62 50.7
19	Adhara	255 47.2	−28 54.7
10	Aldebaran	291 40.3	+16 25.2
32	Alioth	166 59.1	+56 12.1
34	Alkaid	153 33.5	+49 32.1
55	Al Na'ir	28 39.8	−47 11.1
15	Alnilam	276 31.3	− 1 13.8
25	Alphard	218 39.4	− 8 27.7
41	Alphecca	126 48.6	+26 51.7
1	Alpheratz	358 29.9	+28 50.4
51	Altair	62 51.9	+ 8 44.6
2	Ankaa	353 59.7	−42 33.4
42	Antares	113 20.9	−26 20.0
37	Arcturus	146 36.1	+19 24.9
43	Atria	109 03.0	−68 56.6
22	Avior	234 35.7	−59 21.8
13	Bellatrix	279 19.6	+ 6 18.6
16	Betelg'se	271 49.2	+ 7 24.0
17	Canopus	264 15.5	−52 40.4
12	Capella	281 40.0	+45 57.4
53	Deneb	50 02.3	+45 06.8
28	Denebola	183 18.6	+14 49.5
4	Diphda	349 40.6	−18 14.3
27	Dubhe	194 45.3	+61 59.7
14	Elnath	279 08.7	+28 34.4
47	Eltanin	91 07.1	+51 29.3
54	Enif	34 31.1	+ 9 39.8
56	Fomalhaut	16 13.2	−29 52.0
31	Gacrux	172 50.3	−56 51.4
29	Gienah	176 37.9	−17 17.4
35	Hadar	149 51.0	−60 09.1
6	Hamal	328 51.1	+23 14.9
48	Kaus Aust.	84 43.0	−34 24.5
40	Kochab	137 17.4	+74 20.1
57	Markab	14 23.0	+14 57.5
8	Menkar	315 01.6	+ 3 54.7
36	Menkent	149 00.0	−36 08.8
24	Miapl'dus	221 48.6	−69 31.8
9	Mirfak	309 44.2	+49 42.3
50	Nunki	76 53.6	−26 21.4
52	Peacock	54 29.7	−56 53.0
21	Pollux	244 21.7	+28 08.3
20	Procyon	245 45.9	+ 5 20.5
46	R'alhague	96 47.9	+12 35.3
26	Regulus	208 30.4	+12 11.3
11	Rigel	281 54.6	− 8 15.3
38	Rigil Kent.	140 52.6	−60 38.8
44	Sabik	103 03.7	−15 40.3
3	Schedar	350 31.9	+56 17.4
45	Shaula	97 22.5	−37 04.3
18	Sirius	259 12.7	−16 39.2
33	Spica	159 18.0	−10 55.5
23	Suhail	223 24.8	−43 14.9
49	Vega	81 09.4	+38 44.1
39	Zub'g'bi	137 54.6	−15 51.3

Lat.	Sunrise	Twlt. begins	Moonrise 12	13	14	15
N 72	9 08	5 10	▭	▭	▭	▭
70	8 46	5 15	▭	▭	▭	11 04
68	8 28	5 18	▭	▭	▭	12 23
66	8 15	5 21	▭	▭	10 43	13 00
64	8 03	5 23	8 09	9 41	11 36	13 26
62	7 53	5 24	9 21	10 34	12 08	13 46
60	7 45	5 25	9 57	11 06	12 31	14 02
58	7 38	5 26	10 23	11 30	12 50	14 16
56	7 31	5 27	10 43	11 49	13 06	14 28
54	7 25	5 27	11 00	12 05	13 20	14 38
52	7 20	5 28	11 15	12 19	13 31	14 47
50	7 15	5 28	11 27	12 31	13 42	14 56
45	7 05	5 27	11 54	12 56	14 03	15 13
40	6 56	5 26	12 14	13 16	14 21	15 27
35	6 49	5 25	12 32	13 32	14 36	15 39
30	6 42	5 22	12 47	13 47	14 48	15 49
20	6 31	5 16	13 12	14 11	15 10	16 07
10	6 20	5 10	13 34	14 32	15 29	16 22
0	6 11	5 00	13 55	14 52	15 46	16 37
10	6 01	4 49	14 15	15 11	16 03	16 51
20	5 51	4 33	14 37	15 32	16 22	17 06
30	5 38	4 12	15 03	15 56	16 43	17 24
35	5 31	3 58	15 18	16 11	16 56	17 34
40	5 23	3 41	15 35	16 27	17 10	17 46
45	5 14	3 18	15 56	16 47	17 27	17 59
50	5 02	2 47	16 23	17 11	17 48	18 16
52	4 57	2 30	16 35	17 23	17 58	18 23
54	4 51	2 10	16 50	17 36	18 09	18 32
56	4 44	1 41	17 08	17 52	18 21	18 41
58	4 37	0 50	17 28	18 10	18 36	18 52
S 60	4 28	////	17 55	18 33	18 53	19 05

Lat.	Sunset	Twlt. ends	Moonset 12	13	14	15
N 72	15 22	19 24	▭	▭	▭	▭
70	15 44	19 19	▭	▭	▭	9 59
68	16 01	19 15	▭	▭	▭	8 40
66	16 15	19 12	▭	▭	8 31	8 02
64	16 27	19 10	7 09	7 38	7 38	7 35
62	16 36	19 08	5 57	6 45	7 05	7 14
60	16 45	19 07	5 21	6 13	6 41	6 57
58	16 52	19 05	4 55	5 48	6 22	6 42
56	16 58	19 04	4 35	5 29	6 06	6 30
54	17 04	19 04	4 18	5 13	5 52	6 19
52	17 09	19 03	4 04	4 59	5 40	6 09
50	17 14	19 03	3 51	4 46	5 29	6 01
45	17 24	19 03	3 25	4 21	5 06	5 42
40	17 33	19 04	3 04	4 01	4 48	5 27
35	17 40	19 05	2 47	3 44	4 33	5 14
30	17 47	19 08	2 32	3 29	4 19	5 03
20	17 58	19 12	2 07	3 04	3 57	4 44
10	18 08	19 19	1 45	2 42	3 37	4 27
0	18 18	19 29	1 24	2 22	3 18	4 11
10	18 27	19 39	1 04	2 02	2 59	3 55
20	18 38	19 55	0 42	1 40	2 39	3 38
30	18 50	20 15	0 17	1 15	2 16	3 18
35	18 57	20 29	0 02	1 00	2 02	3 06
40	19 05	20 46	24 45	0 45	1 46	2 52
45	19 14	21 07	24 22	0 22	1 27	2 36
50	19 25	21 37	23 56	25 03	1 03	2 17
52	19 30	21 53	23 43	24 52	0 52	2 07
54	19 36	22 13	23 28	24 39	0 39	1 56
56	19 43	22 40	23 11	24 24	0 24	1 44
58	19 50	23 24	22 50	24 06	0 06	1 30
S 60	19 58	////	22 24	23 44	25 14	1 14

GMT (h)	Equation of Time (App.—Mean) 12 (m s)	13 (m s)	14 (m s)
0	−14 20.1	−14 19.5	−14 18.2
6	−14 20.0	−14 19.2	−14 17.7
12	−14 19.9	−14 18.9	−14 17.2
18	−14 19.7	−14 18.6	−14 16.6
24	−14 19.5	−14 18.2	−14 16.0

GMT of Transit
Meridian of Greenwich

DAY	Moon (h m)	Venus (h m)	Mars (h m)	Jupiter (h m)	Saturn (h m)
12	20 09	12 29	6 31	19 32	5 04
13	21 05	12 30	6 29	19 28	5 00
14	21 59	12 31	6 27	19 24	4 56
15	22 48	12 32	6 26	19 20	4 52

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0			
30	0.5	0.1	0.1
45	0.5	0.1	0.1
60	0.5	0.1	0.1
75	0.5	0.0	0.0
90	0.5	0.0	0.0

Moon's Lower Limb
Add

Alt. °	12 ′	13 ′	14 ′
0			
4	16.4	15.8	15.2
8	16.4	15.8	15.2
12	16.4	15.8	15.2
16	16.4	15.8	15.2
20	16.4	15.8	15.2
24	16.4	15.8	15.2
28	16.4	15.8	15.2
32	16.3	15.8	15.2
36	16.3	15.8	15.2
40	16.3	15.8	15.2
44	16.3	15.8	15.2
48	16.2	15.7	15.3
52	16.2	15.7	15.3
56	16.2	15.7	15.3
60	16.1	15.7	15.3
64	16.1	15.7	15.3
68	16.0	15.7	15.3
72	16.0	15.7	15.4
76	15.9	15.7	15.4
80	15.9	15.6	15.4
84	15.8	15.6	15.4
88	15.8	15.6	15.4
90	15.8	15.6	15.5

Add to table, back cover

Moon's Upper Limb
Subtract

Alt. °	12 ′	13 ′	14 ′
0			
4	15.0	15.4	15.8
8	15.0	15.4	15.8
12	15.1	15.4	15.8
16	15.1	15.4	15.8
20	15.1	15.4	15.8
24	15.1	15.4	15.7
28	15.1	15.4	15.7
32	15.1	15.4	15.7
36	15.2	15.4	15.7
40	15.2	15.4	15.7
44	15.2	15.5	15.7
48	15.3	15.5	15.7
52	15.3	15.5	15.7
56	15.3	15.5	15.6
60	15.4	15.5	15.6
64	15.4	15.5	15.6
68	15.5	15.5	15.6
72	15.5	15.5	15.6
76	15.5	15.6	15.6
80	15.6	15.6	15.5
84	15.6	15.6	15.5
88	15.7	15.6	15.5
90	15.7	15.6	15.5

Subtract from table, back cover

Lincoln's Birthday 12
Septuagesima Sunday 14

GMT		♈ GHA	VENUS −3.5 GHA	VENUS Dec.	MARS 1.0 GHA	MARS Dec.	JUPITER −2.0 GHA	JUPITER Dec.	SATURN 0.7 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
15	0	144 27.9	172 12.9	−12 55.8	263 27.9	−19 53.5	69 08.9	+22 26.0	286 41.4	−12 12.7	29 19.6	100	+21 29.0	−83
	1	159 30.4	187 12.4	54.7	278 28.9	53.8	84 11.4	26.0	301 43.9	12.7	43 48.6	101	21 20.7	−85
	2	174 32.8	202 11.8	53.6	293 29.9	54.1	99 13.8	26.0	316 46.3	12.7	58 17.7	101	21 12.2	−86
	3	189 35.3	217 11.3	·· 52.5	308 31.0	·· 54.4	114 16.2	·· 26.0	331 48.8	·· 12.7	72 46.8	103	·21 03.6	−87
	4	204 37.7	232 10.7	51.4	323 32.0	54.7	129 18.6	26.0	346 51.2	12.7	87 16.1	103	20 54.9	−88
	5	219 40.2	247 10.2	50.4	338 33.0	54.9	144 21.1	26.0	1 53.7	12.7	101 45.4	104	20 46.1	−89
	6	234 42.7	262 09.6	−12 49.3	353 34.1	−19 55.2	159 23.5	+22 26.0	16 56.1	−12 12.7	116 14.8	106	+20 37.2	−89
	7	249 45.1	277 09.1	48.2	8 35.1	55.5	174 25.9	26.1	31 58.6	12.7	130 44.4	105	20 28.3	−91
	8	264 47.6	292 08.6	47.1	23 36.1	55.8	189 28.3	26.1	47 01.0	12.6	145 13.9	107	20 19.2	−92
	9	279 50.1	307 08.0	·· 46.0	38 37.2	·· 56.1	204 30.7	·· 26.1	62 03.5	·· 12.6	159 43.6	108	·20 10.0	−93
	10	294 52.5	322 07.5	44.9	53 38.2	56.4	219 33.2	26.1	77 06.0	12.6	174 13.4	108	20 00.7	−93
	11	309 55.0	337 06.9	43.8	68 39.3	56.7	234 35.6	26.1	92 08.4	12.6	188 43.2	110	19 51.4	−95
	12	324 57.5	352 06.4	−12 42.7	83 40.3	−19 57.0	249 38.0	+22 26.1	107 10.9	−12 12.6	203 13.2	110	+19 41.9	−95
	13	339 59.9	7 05.8	41.7	98 41.3	57.3	264 40.4	26.1	122 13.3	12.6	217 43.2	111	19 32.4	−97
	14	355 02.4	22 05.3	40.6	113 42.4	57.5	279 42.8	26.1	137 15.8	12.6	232 13.3	112	19 22.7	−97
	15	10 04.9	37 04.7	·· 39.5	128 43.4	·· 57.8	294 45.3	·· 26.2	152 18.2	·· 12.6	246 43.5	112	·19 13.0	−98
	16	25 07.3	52 04.2	38.4	143 44.4	58.1	309 47.7	26.2	167 20.7	12.6	261 13.7	114	19 03.2	−99
	17	40 09.8	67 03.7	37.3	158 45.5	58.4	324 50.1	26.2	182 23.1	12.6	275 44.1	114	18 53.3	−100
	18	55 12.2	82 03.1	−12 36.2	173 46.5	−19 58.7	339 52.5	+22 26.2	197 25.6	−12 12.6	290 14.5	116	+18 43.3	−101
	19	70 14.7	97 02.6	35.1	188 47.6	59.0	354 54.9	26.2	212 28.0	12.6	304 45.1	116	18 33.2	−101
	20	85 17.2	112 02.0	34.0	203 48.6	59.3	9 57.3	26.2	227 30.5	12.6	319 15.7	117	18 23.1	−103
	21	100 19.6	127 01.5	·· 32.9	218 49.6	·· 59.5	24 59.8	·· 26.2	242 33.0	·· 12.5	333 46.4	117	·18 12.8	−103
	22	115 22.1	142 01.0	31.8	233 50.7	19 59.8	40 02.2	26.2	257 35.4	12.5	348 17.1	119	18 02.5	−104
	23	130 24.6	157 00.4	30.7	248 51.7	20 00.1	55 04.6	26.3	272 37.9	12.5	2 48.0	119	17 52.1	−105
16	0	145 27.0	171 59.9	−12 29.6	263 52.7	−20 00.4	70 07.0	+22 26.3	287 40.3	−12 12.5	17 18.9	120	+17 41.6	−105
	1	160 29.5	186 59.4	28.5	278 53.8	00.7	85 09.4	26.3	302 42.8	12.5	31 49.9	121	17 31.1	−106
	2	175 32.0	201 58.8	27.4	293 54.8	01.0	100 11.8	26.3	317 45.2	12.5	46 21.0	122	17 20.5	−107
	3	190 34.4	216 58.3	·· 26.3	308 55.9	·· 01.3	115 14.2	·· 26.3	332 47.7	·· 12.5	60 52.2	123	·17 09.8	−108
	4	205 36.9	231 57.7	25.2	323 56.9	01.5	130 16.7	26.3	347 50.1	12.5	75 23.5	123	16 59.0	−108
	5	220 39.4	246 57.2	24.1	338 57.9	01.8	145 19.1	26.3	2 52.6	12.5	89 54.8	124	16 48.2	−109
	6	235 41.8	261 56.7	−12 23.0	353 59.0	−20 02.1	160 21.5	+22 26.3	17 55.1	−12 12.5	104 26.2	125	+16 37.3	−110
	7	250 44.3	276 56.1	21.9	9 00.0	02.4	175 23.9	26.4	32 57.5	12.5	118 57.7	126	16 26.3	−111
	8	265 46.7	291 55.6	20.8	24 01.1	02.7	190 26.3	26.4	48 00.0	12.5	133 29.3	126	16 15.2	−111
	9	280 49.2	306 55.1	·· 19.7	39 02.1	·· 03.0	205 28.7	·· 26.4	63 02.4	·· 12.4	148 00.9	128	·16 04.1	−112
	10	295 51.7	321 54.5	18.6	54 03.1	03.2	220 31.1	26.4	78 04.9	12.4	162 32.7	128	15 52.9	−112
	11	310 54.1	336 54.0	17.5	69 04.2	03.5	235 33.5	26.4	93 07.3	12.4	177 04.5	129	15 41.7	−113
	12	325 56.6	351 53.5	−12 16.4	84 05.2	−20 03.8	250 35.9	+22 26.4	108 09.8	−12 12.4	191 36.4	129	+15 30.4	−114
	13	340 59.1	6 52.9	15.3	99 06.3	04.1	265 38.4	26.4	123 12.3	12.4	206 08.3	131	15 19.0	−114
	14	356 01.5	21 52.4	14.2	114 07.3	04.4	280 40.8	26.4	138 14.7	12.4	220 40.4	131	15 07.6	−115
	15	11 04.0	36 51.9	·· 13.1	129 08.3	·· 04.7	295 43.2	·· 26.5	153 17.2	·· 12.4	235 12.5	131	·14 56.1	−116
	16	26 06.5	51 51.3	12.0	144 09.4	04.9	310 45.6	26.5	168 19.6	12.4	249 44.6	133	14 44.5	−116
	17	41 08.9	66 50.8	10.9	159 10.4	05.2	325 48.0	26.5	183 22.1	12.4	264 16.9	133	14 32.9	−117
	18	56 11.4	81 50.3	−12 09.8	174 11.5	−20 05.5	340 50.4	+22 26.5	198 24.5	−12 12.4	278 49.2	134	+14 21.2	−117
	19	71 13.8	96 49.8	08.7	189 12.5	05.8	355 52.8	26.5	213 27.0	12.4	293 21.6	135	14 09.5	−118
	20	86 16.3	111 49.2	07.5	204 13.5	06.1	10 55.2	26.5	228 29.5	12.4	307 54.1	135	13 57.7	−118
	21	101 18.8	126 48.7	·· 06.4	219 14.6	·· 06.4	25 57.6	·· 26.5	243 31.9	·· 12.3	322 26.6	136	·13 45.9	−119
	22	116 21.2	141 48.2	05.3	234 15.6	06.6	41 00.0	26.6	258 34.4	12.3	336 59.2	137	13 34.0	−119
	23	131 23.7	156 47.6	04.2	249 16.7	06.9	56 02.4	26.6	273 36.8	12.3	351 31.9	137	13 22.1	−120
17	0	146 26.2	171 47.1	−12 03.1	264 17.7	−20 07.2	71 04.8	+22 26.6	288 39.3	−12 12.3	6 04.6	138	+13 10.1	−121
	1	161 28.6	186 46.6	02.0	279 18.7	07.5	86 07.2	26.6	303 41.8	12.3	20 37.4	139	12 58.0	−120
	2	176 31.1	201 46.1	12 00.9	294 19.8	07.8	101 09.7	26.6	318 44.2	12.3	35 10.3	139	12 46.0	−122
	3	191 33.6	216 45.5	·11 59.8	309 20.8	·· 08.0	116 12.1	·· 26.6	333 46.7	·· 12.3	49 43.2	141	·12 33.8	−121
	4	206 36.0	231 45.0	58.7	324 21.9	08.3	131 14.5	26.6	348 49.1	12.3	64 16.3	140	12 21.7	−123
	5	221 38.5	246 44.5	57.5	339 22.9	08.6	146 16.9	26.6	3 51.6	12.3	78 49.3	142	12 09.4	−122
	6	236 41.0	261 44.0	−11 56.4	354 23.9	−20 08.9	161 19.3	+22 26.7	18 54.1	−12 12.3	93 22.5	142	+11 57.2	−123
	7	251 43.4	276 43.4	55.3	9 25.0	09.1	176 21.7	26.7	33 56.5	12.3	107 55.7	143	11 44.9	−124
	8	266 45.9	291 42.9	54.2	24 26.0	09.4	191 24.1	26.7	48 59.0	12.2	122 28.9	143	11 32.5	−124
	9	281 48.3	306 42.4	·· 53.1	39 27.1	·· 09.7	206 26.5	·· 26.7	64 01.4	·· 12.2	137 02.2	144	·11 20.1	−124
	10	296 50.8	321 41.9	52.0	54 28.1	10.0	221 28.9	26.7	79 03.9	12.2	151 35.6	144	11 07.7	−125
	11	311 53.3	336 41.3	50.8	69 29.1	10.3	236 31.3	26.7	94 06.4	12.2	166 09.0	145	10 55.2	−125
	12	326 55.7	351 40.8	−11 49.7	84 30.2	−20 10.5	251 33.7	+22 26.7	109 08.8	−12 12.2	180 42.5	146	+10 42.7	−125
	13	341 58.2	6 40.3	48.6	99 31.2	10.8	266 36.1	26.8	124 11.3	12.2	195 16.1	146	10 30.2	−126
	14	357 00.7	21 39.8	47.5	114 32.3	11.1	281 38.5	26.8	139 13.8	12.2	209 49.7	147	10 17.6	−126
	15	12 03.1	36 39.3	·· 46.4	129 33.3	·· 11.4	296 40.9	·· 26.8	154 16.2	·· 12.2	224 23.4	147	·10 05.0	−127
	16	27 05.6	51 38.7	45.3	144 34.3	11.7	311 43.3	26.8	169 18.7	12.2	238 57.1	148	9 52.3	−126
	17	42 08.1	66 38.2	44.1	159 35.4	11.9	326 45.7	26.8	184 21.1	12.2	253 30.9	148	9 39.7	−127
	18	57 10.5	81 37.7	−11 43.0	174 36.4	−20 12.2	341 48.1	+22 26.8	199 23.6	−12 12.1	268 04.7	149	+ 9 27.0	−128
	19	72 13.0	96 37.2	41.9	189 37.5	12.5	356 50.5	26.8	214 26.1	12.1	282 38.6	149	9 14.2	−127
	20	87 15.5	111 36.7	40.8	204 38.5	12.8	11 52.9	26.8	229 28.5	12.1	297 12.5	150	9 01.5	−128
	21	102 17.9	126 36.1	·· 39.6	219 39.6	·· 13.0	26 55.3	·· 26.9	244 31.0	·· 12.1	311 46.5	150	· 8 48.7	−129
	22	117 20.4	141 35.6	38.5	234 40.6	13.3	41 57.7	26.9	259 33.5	12.1	326 20.5	151	8 35.8	−128
	23	132 22.8	156 35.1	37.4	249 41.6	13.6	57 00.1	26.9	274 35.9	12.1	340 54.6	152	8 23.0	−129
	24	147 25.3	171 34.6	−11 36.3	264 42.7	−20 13.9	72 02.5	+22 26.9	289 38.4	−12 12.1	355 28.8	151	+ 8 10.1	−129
code		—	− 6	+ 11	+ 11	− 3	+ 25	0	+ 25	0				

GMT		SUN GHA		SUN Dec.	
h		° ′		°	′
15	0	176 26.0		−12	55.9
	1	191 26.0			55.1
	2	206 26.1			54.2
	3	221 26.1	··		53.4
	4	236 26.1			52.5
	5	251 26.1			51.7
	6	266 26.2		−12	50.8
	7	281 26.2			50.0
	8	296 26.2			49.1
	9	311 26.3	··		48.2
	10	326 26.3			47.4
	11	341 26.3			46.5
	12	356 26.3		−12	45.7
	13	11 26.4			44.8
	14	26 26.4			44.0
	15	41 26.4	··		43.1
	16	56 26.5			42.3
	17	71 26.5			41.4
	18	86 26.5		−12	40.5
	19	101 26.6			39.7
	20	116 26.6			38.8
	21	131 26.6	··		38.0
	22	146 26.7			37.1
	23	161 26.7			36.2
16	0	176 26.7		−12	35.4
	1	191 26.8			34.5
	2	206 26.8			33.7
	3	221 26.8	··		32.8
	4	236 26.9			31.9
	5	251 26.9			31.1
	6	266 26.9		−12	30.2
	7	281 27.0			29.3
	8	296 27.0			28.5
	9	311 27.1	··		27.6
	10	326 27.1			26.8
	11	341 27.1			25.9
	12	356 27.2		−12	25.0
	13	11 27.2			24.2
	14	26 27.2			23.3
	15	41 27.3	··		22.4
	16	56 27.3			21.6
	17	71 27.4			20.7
	18	86 27.4		−12	19.8
	19	101 27.4			19.0
	20	116 27.5			18.1
	21	131 27.5	··		17.2
	22	146 27.6			16.4
	23	161 27.6			15.5
17	0	176 27.6		−12	14.6
	1	191 27.7			13.8
	2	206 27.7			12.9
	3	221 27.8	··		12.0
	4	236 27.8			11.1
	5	251 27.9			10.3
	6	266 27.9		−12	09.4
	7	281 27.9			08.5
	8	296 28.0			07.7
	9	311 28.0	··		06.8
	10	326 28.1			05.9
	11	341 28.1			05.0
	12	356 28.2		−12	04.2
	13	11 28.2			03.3
	14	26 28.2			02.4
	15	41 28.3	··		01.6
	16	56 28.3		12	00.7
	17	71 28.4		11	59.8
	18	86 28.4		−11	58.9
	19	101 28.5			58.1
	20	116 28.5			57.2
	21	131 28.6	··		56.3
	22	146 28.6			55.4
	23	161 28.7			54.6
	24	176 28.7		−11	53.7
code		—			+ 8

STARS No.	Name	SHA ° ′	Dec. ° ′
7	Acamar	315 52.0	−40 29.4
5	Achernar	335 59.9	−57 28.3
30	Acrux	173 58.8	−62 50.7
19	Adhara	255 47.2	−28 54.7
10	Aldebaran	291 40.4	+16 25.2
32	Alioth	166 59.1	+56 12.1
34	Alkaid	153 33.5	+49 32.1
55	Al Na'ir	28 39.8	−47 11.1
15	Alnilam	276 31.3	− 1 13.8
25	Alphard	218 39.4	− 8 27.7
41	Alphecca	126 48.6	+26 51.7
1	Alpheratz	358 29.9	+28 50.3
51	Altair	62 51.9	+ 8 44.6
2	Ankaa	353 59.7	−42 33.4
42	Antares	113 20.9	−26 20.0
37	Arcturus	146 36.1	+19 24.9
43	Atria	109 02.9	−68 56.6
22	Avior	234 35.8	−59 21.8
13	Bellatrix	279 19.6	+ 6 18.6
16	Betelg'se	271 49.2	+ 7 24.0
17	Canopus	264 15.6	−52 40.4
12	Capella	281 40.0	+45 57.4
53	Deneb	50 02.3	+45 06.8
28	Denebola	183 18.6	+14 49.5
4	Diphda	349 40.7	−18 14.3
27	Dubhe	194 45.2	+61 59.7
14	Elnath	279 08.7	+28 34.4
47	Eltanin	91 07.1	+51 29.3
54	Enif	34 31.1	+ 9 39.8
56	Fomalhaut	16 13.2	−29 52.0
31	Gacrux	172 50.3	−56 51.4
29	Gienah	176 37.9	−17 17.4
35	Hadar	149 51.0	−60 09.1
6	Hamal	328 51.2	+23 14.9
48	Kaus Aust.	84 43.0	−34 24.5
40	Kochab	137 17.4	+74 20.1
57	Markab	14 23.0	+14 57.5
8	Menkar	315 01.6	+ 3 54.7
36	Menkent	149 00.0	−36 08.8
24	Miapl'dus	221 48.6	−69 31.8
9	Mirfak	309 44.2	+49 42.3
50	Nunki	76 53.6	−26 21.4
52	Peacock	54 29.6	−56 53.0
21	Pollux	244 21.7	+28 08.3
20	Procyon	245 46.0	+ 5 20.5
46	R'alhague	96 47.9	+12 35.3
26	Regulus	208 30.4	+12 11.3
11	Rigel	281 54.7	− 8 15.3
38	Rigil Kent.	140 52.5	−60 38.8
44	Sabik	103 03.7	−15 40.3
3	Schedar	350 31.9	+56 17.4
45	Shaula	97 22.5	−37 04.3
18	Sirius	259 12.7	−16 39.2
33	Spica	159 18.0	−10 55.5
23	Suhail	223 24.8	−43 14.9
49	Vega	81 09.4	+38 44.1
39	Zub'g'bi	137 54.6	−15 51.3

Lat.	Sunrise	Twlt. begins	Moonrise 15	Moonrise 16	Moonrise 17	Moonrise 18
N °	h m	h m	h m	h m	h m	h m
72	8 51	4 58	▭	13 32	15 56	17 57
70	8 31	5 03	11 04	14 08	16 12	18 03
68	8 16	5 08	12 23	14 33	16 25	18 08
66	8 04	5 11	13 00	14 53	16 36	18 12
64	7 53	5 14	13 26	15 08	16 44	18 15
62	7 44	5 16	13 46	15 21	16 52	18 18
60	7 37	5 18	14 02	15 32	16 58	18 21
58	7 30	5 20	14 16	15 41	17 04	18 23
56	7 24	5 20	14 28	15 50	17 09	18 25
54	7 19	5 22	14 38	15 57	17 13	18 27
52	7 14	5 22	14 47	16 03	17 17	18 29
50	7 10	5 23	14 56	16 09	17 21	18 30
45	7 00	5 23	15 13	16 22	17 29	18 34
40	6 52	5 23	15 27	16 32	17 35	18 36
35	6 46	5 22	15 39	16 41	17 41	18 39
30	6 40	5 20	15 49	16 49	17 46	18 41
20	6 29	5 16	16 07	17 02	17 54	18 44
10	6 20	5 09	16 22	17 13	18 02	18 47
0	6 11	5 01	16 37	17 24	18 08	18 50
10	6 02	4 50	16 51	17 35	18 15	18 53
20	5 52	4 35	17 06	17 46	18 23	18 57
30	5 41	4 15	17 24	17 59	18 31	19 00
35	5 34	4 02	17 34	18 07	18 36	19 02
40	5 27	3 46	17 46	18 15	18 41	19 04
45	5 18	3 25	17 59	18 25	18 47	19 07
50	5 07	2 56	18 16	18 37	18 55	19 10
52	5 02	2 41	18 23	18 43	18 58	19 12
54	4 57	2 22	18 32	18 49	19 02	19 13
56	4 51	1 58	18 41	18 55	19 06	19 15
58	4 44	1 22	18 52	19 03	19 11	19 17
60	4 36	////	19 05	19 11	19 16	19 19
S						

Lat.	Sunset	Twlt. ends	Moonset 15	Moonset 16	Moonset 17	Moonset 18
N °	h m	h m	h m	h m	h m	h m
72	15 40	19 36	▭	9 14	8 23	7 52
70	15 59	19 31	9 59	8 36	8 05	7 43
68	16 14	19 25	8 40	8 09	7 50	7 36
66	16 26	19 21	8 02	7 48	7 38	7 30
64	16 36	19 18	7 35	7 32	7 28	7 24
62	16 45	19 15	7 14	7 18	7 19	7 20
60	16 53	19 14	6 57	7 06	7 12	7 16
58	16 59	19 12	6 42	6 56	7 05	7 12
56	17 05	19 10	6 30	6 47	6 59	7 09
54	17 10	19 09	6 19	6 39	6 54	7 06
52	17 15	19 09	6 09	6 32	6 49	7 04
50	17 19	19 08	6 01	6 25	6 45	7 01
45	17 29	19 08	5 42	6 11	6 35	6 56
40	17 37	19 08	5 27	6 00	6 27	6 52
35	17 43	19 08	5 14	5 50	6 21	6 48
30	17 49	19 09	5 03	5 41	6 14	6 45
20	18 00	19 14	4 44	5 26	6 04	6 39
10	18 09	19 20	4 27	5 12	5 54	6 34
0	18 18	19 28	4 11	5 00	5 46	6 29
10	18 26	19 38	3 55	4 47	5 37	6 24
20	18 36	19 52	3 38	4 34	5 27	6 19
30	18 47	20 12	3 18	4 18	5 16	6 12
35	18 54	20 25	3 06	4 09	5 10	6 09
40	19 01	20 41	2 52	3 58	5 03	6 05
45	19 10	21 01	2 36	3 46	4 54	6 00
50	19 20	21 29	2 17	3 31	4 44	5 54
52	19 25	21 44	2 07	3 24	4 39	5 52
54	19 30	22 02	1 56	3 16	4 34	5 49
56	19 36	22 25	1 44	3 07	4 28	5 46
58	19 43	22 58	1 30	2 57	4 21	5 42
60	19 50	////	1 14	2 45	4 13	5 38
S						

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.5	0.1	0.1
30			
	0.5	0.1	0.1
45			
	0.5	0.1	0.1
60			
	0.5	0.0	0.0
75			
	0.5	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	15	16	17
°	′	′	′
0			
	14.5	13.9	13.4
4			
	14.5	13.9	13.4
8			
	14.5	13.9	13.4
12			
	14.6	13.9	13.4
16			
	14.6	14.0	13.5
20			
	14.6	14.0	13.5
24			
	14.6	14.0	13.6
28			
	14.6	14.1	13.6
32			
	14.7	14.1	13.7
36			
	14.7	14.2	13.7
40			
	14.7	14.2	13.8
44			
	14.8	14.3	13.9
48			
	14.8	14.4	14.0
52			
	14.9	14.4	14.1
56			
	14.9	14.5	14.2
60			
	15.0	14.6	14.3
64			
	15.0	14.7	14.4
68			
	15.1	14.8	14.5
72			
	15.1	14.8	14.6
76			
	15.2	14.9	14.7
80			
	15.2	15.0	14.9
84			
	15.3	15.1	15.0
88			
	15.3	15.2	15.1
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	15	16	17
°	′	′	′
0			
	16.1	16.5	16.8
4			
	16.1	16.5	16.8
8			
	16.1	16.5	16.8
12			
	16.1	16.5	16.7
16			
	16.1	16.4	16.7
20			
	16.1	16.4	16.7
24			
	16.1	16.4	16.6
28			
	16.0	16.3	16.6
32			
	16.0	16.3	16.5
36			
	16.0	16.2	16.4
40			
	15.9	16.2	16.4
44			
	15.9	16.1	16.3
48			
	15.8	16.0	16.2
52			
	15.8	16.0	16.1
56			
	15.8	15.9	16.0
60			
	15.7	15.8	15.9
64			
	15.7	15.7	15.8
68			
	15.6	15.6	15.7
72			
	15.6	15.6	15.6
76			
	15.5	15.5	15.4
80			
	15.4	15.4	15.3
84			
	15.4	15.3	15.2
88			
	15.3	15.2	15.1
90			

Subtract from table, back cover

Equation of Time (App.—Mean)

GMT	15	16	17
h	m s	m s	m s
0	−14 16.0	−14 13.1	−14 09.5
6	−14 15.4	−14 12.3	−14 08.5
12	−14 14.7	−14 11.4	−14 07.5
18	−14 13.9	−14 10.5	−14 06.4
24	−14 13.1	−14 09.5	−14 05.2

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
15	22 48	12 32	6 26	19 20	4 52
16	23 35	12 33	6 24	19 16	4 49
17	24 19	12 33	6 22	19 13	4 45
18	0 19	12 34	6 21	19 09	4 41

Full Moon 17

G.M.T.	h	♈ GHA	VENUS −3.4 GHA	VENUS Dec.	MARS 1.0 GHA	MARS Dec.	JUPITER −2.0 GHA	JUPITER Dec.	SATURN 0.7 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
		° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
18	0	147 25.3	171 34.6	−11 36.3	264 42.7	−20 13.9	72 02.5	+22 26.9	289 38.4	−12 12.1	355 28.8	151	+ 8 10.1	−129
	1	162 27.8	186 34.1	35.2	279 43.7	14.1	87 04.9	26.9	304 40.8	12.1	10 02.9	153	7 57.2	−129
	2	177 30.2	201 33.6	34.0	294 44.8	14.4	102 07.3	26.9	319 43.3	12.1	24 37.2	152	7 44.3	−130
	3	192 32.7	216 33.0	·· 32.9	309 45.8	·· 14.7	117 09.7	·· 26.9	334 45.8	·· 12.0	39 11.4	154	· 7 31.3	−129
	4	207 35.2	231 32.5	31.8	324 46.9	15.0	132 12.0	27.0	349 48.2	12.0	53 45.8	153	7 18.4	−130
	5	222 37.6	246 32.0	30.6	339 47.9	15.2	147 14.4	27.0	4 50.7	12.0	68 20.1	154	7 05.4	−130
	6	237 40.1	261 31.5	−11 29.5	354 48.9	−20 15.5	162 16.8	+22 27.0	19 53.2	−12 12.0	82 54.5	155	+ 6 52.4	−131
	7	252 42.6	276 31.0	28.4	9 50.0	15.8	177 19.2	27.0	34 55.6	12.0	97 29.0	155	6 39.3	−130
	8	267 45.0	291 30.5	27.3	24 51.0	16.1	192 21.6	27.0	49 58.1	12.0	112 03.5	155	6 26.3	−131
	9	282 47.5	306 30.0	·· 26.1	39 52.1	·· 16.3	207 24.0	·· 27.0	65 00.6	·· 12.0	126 38.0	156	· 6 13.2	−131
	10	297 49.9	321 29.4	25.0	54 53.1	16.6	222 26.4	27.0	80 03.0	12.0	141 12.6	156	6 00.1	−131
	11	312 52.4	336 28.9	23.9	69 54.2	16.9	237 28.8	27.1	95 05.5	12.0	155 47.2	156	5 47.0	−131
	12	327 54.9	351 28.4	−11 22.7	84 55.2	−20 17.2	252 31.2	+22 27.1	110 08.0	−12 11.9	170 21.8	157	+ 5 33.9	−131
	13	342 57.3	6 27.9	21.6	99 56.2	17.4	267 33.6	27.1	125 10.4	11.9	184 56.5	157	5 20.8	−131
	14	357 59.8	21 27.4	20.5	114 57.3	17.7	282 36.0	27.1	140 12.9	11.9	199 31.2	158	5 07.7	−132
	15	13 02.3	36 26.9	·· 19.3	129 58.3	·· 18.0	297 38.4	·· 27.1	155 15.4	·· 11.9	214 06.0	158	· 4 54.5	−132
	16	28 04.7	51 26.4	18.2	144 59.4	18.2	312 40.8	27.1	170 17.8	11.9	228 40.8	158	4 41.3	−131
	17	43 07.2	66 25.9	17.1	160 00.4	18.5	327 43.1	27.1	185 20.3	11.9	243 15.6	159	4 28.2	−132
	18	58 09.7	81 25.4	−11 16.0	175 01.5	−20 18.8	342 45.5	+22 27.2	200 22.8	−12 11.9	257 50.5	159	+ 4 15.0	−132
	19	73 12.1	96 24.9	14.8	190 02.5	19.1	357 47.9	27.2	215 25.2	11.9	272 25.4	159	4 01.8	−132
	20	88 14.6	111 24.4	13.7	205 03.6	19.3	12 50.3	27.2	230 27.7	11.9	287 00.3	159	3 48.6	−132
	21	103 17.1	126 23.8	·· 12.5	220 04.6	·· 19.6	27 52.7	·· 27.2	245 30.2	·· 11.8	301 35.2	160	· 3 35.4	−132
	22	118 19.5	141 23.3	11.4	235 05.6	19.9	42 55.1	27.2	260 32.6	11.8	316 10.2	160	3 22.2	−132
	23	133 22.0	156 22.8	10.3	250 06.7	20.1	57 57.5	27.2	275 35.1	11.8	330 45.2	160	3 09.0	−132
19	0	148 24.4	171 22.3	−11 09.1	265 07.7	−20 20.4	72 59.9	+22 27.2	290 37.6	−12 11.8	345 20.2	161	+ 2 55.8	−133
	1	163 26.9	186 21.8	08.0	280 08.8	20.7	88 02.3	27.3	305 40.0	11.8	359 55.3	161	2 42.5	−132
	2	178 29.4	201 21.3	06.9	295 09.8	20.9	103 04.6	27.3	320 42.5	11.8	14 30.4	161	2 29.3	−132
	3	193 31.8	216 20.8	·· 05.7	310 10.9	·· 21.2	118 07.0	·· 27.3	335 45.0	·· 11.8	29 05.5	161	· 2 16.1	−132
	4	208 34.3	231 20.3	04.6	325 11.9	21.5	133 09.4	27.3	350 47.4	11.8	43 40.6	161	2 02.9	−133
	5	223 36.8	246 19.8	03.4	340 13.0	21.8	148 11.8	27.3	5 49.9	11.7	58 15.7	162	1 49.6	−132
	6	238 39.2	261 19.3	−11 02.3	355 14.0	−20 22.0	163 14.2	+22 27.3	20 52.4	−12 11.7	72 50.9	162	+ 1 36.4	−132
	7	253 41.7	276 18.8	01.2	10 15.1	22.3	178 16.6	27.4	35 54.8	11.7	87 26.1	162	1 23.2	−133
	8	268 44.2	291 18.3	11 00.0	25 16.1	22.6	193 19.0	27.4	50 57.3	11.7	102 01.3	163	1 09.9	−132
	9	283 46.6	306 17.8	·10 58.9	40 17.1	·· 22.8	208 21.3	·· 27.4	65 59.8	·· 11.7	116 36.6	162	· 0 56.7	−132
	10	298 49.1	321 17.3	57.7	55 18.2	23.1	223 23.7	27.4	81 02.3	11.7	131 11.8	163	0 43.5	−132
	11	313 51.6	336 16.8	56.6	70 19.2	23.4	238 26.1	27.4	96 04.7	11.7	145 47.1	163	0 30.3	−132
	12	328 54.0	351 16.3	−10 55.5	85 20.3	−20 23.6	253 28.5	+22 27.4	111 07.2	−12 11.7	160 22.4	163	+ 0 17.1	−132
	13	343 56.5	6 15.8	54.3	100 21.3	23.9	268 30.9	27.4	126 09.7	11.6	174 57.7	163	+ 0 03.9	−132
	14	358 58.9	21 15.3	53.2	115 22.4	24.2	283 33.3	27.5	141 12.1	11.6	189 33.0	163	− 0 09.3	−132
	15	14 01.4	36 14.8	·· 52.0	130 23.4	·· 24.4	298 35.6	·· 27.5	156 14.6	·· 11.6	204 08.3	163	· 0 22.5	−132
	16	29 03.9	51 14.3	50.9	145 24.5	24.7	313 38.0	27.5	171 17.1	11.6	218 43.6	164	0 35.7	−132
	17	44 06.3	66 13.8	49.7	160 25.5	25.0	328 40.4	27.5	186 19.5	11.6	233 19.0	163	0 48.9	−131
	18	59 08.8	81 13.3	−10 48.6	175 26.6	−20 25.2	343 42.8	+22 27.5	201 22.0	−12 11.6	247 54.3	164	− 1 02.0	−132
	19	74 11.3	96 12.8	47.4	190 27.6	25.5	358 45.2	27.5	216 24.5	11.6	262 29.7	164	1 15.2	−131
	20	89 13.7	111 12.3	46.3	205 28.7	25.8	13 47.6	27.6	231 27.0	11.6	277 05.1	164	1 28.3	−131
	21	104 16.2	126 11.8	·· 45.1	220 29.7	·· 26.0	28 49.9	·· 27.6	246 29.4	·· 11.5	291 40.5	164	· 1 41.4	−131
	22	119 18.7	141 11.3	44.0	235 30.8	26.3	43 52.3	27.6	261 31.9	11.5	306 15.9	164	1 54.5	−131
	23	134 21.1	156 10.8	42.9	250 31.8	26.6	58 54.7	27.6	276 34.4	11.5	320 51.3	164	2 07.6	−131
20	0	149 23.6	171 10.3	−10 41.7	265 32.9	−20 26.8	73 57.1	+22 27.6	291 36.9	−12 11.5	335 26.7	164	− 2 20.7	−131
	1	164 26.0	186 09.8	40.6	280 33.9	27.1	88 59.5	27.6	306 39.3	11.5	350 02.1	164	2 33.8	−131
	2	179 28.5	201 09.3	39.4	295 34.9	27.4	104 01.8	27.6	321 41.8	11.5	4 37.5	164	2 46.9	−130
	3	194 31.0	216 08.8	·· 38.3	310 36.0	·· 27.6	119 04.2	·· 27.7	336 44.3	·· 11.5	19 12.9	164	· 2 59.9	−130
	4	209 33.4	231 08.3	37.1	325 37.0	27.9	134 06.6	27.7	351 46.7	11.5	33 48.3	164	3 12.9	−130
	5	224 35.9	246 07.8	36.0	340 38.1	28.2	149 09.0	27.7	6 49.2	11.4	48 23.7	164	3 25.9	−130
	6	239 38.4	261 07.3	−10 34.8	355 39.1	−20 28.4	164 11.3	+22 27.7	21 51.7	−12 11.4	62 59.1	164	− 3 38.9	−130
	7	254 40.8	276 06.8	33.6	10 40.2	28.7	179 13.7	27.7	36 54.2	11.4	77 34.5	165	3 51.9	−129
	8	269 43.3	291 06.4	32.5	25 41.2	29.0	194 16.1	27.7	51 56.6	11.4	92 10.0	164	4 04.8	−129
	9	284 45.8	306 05.9	·· 31.3	40 42.3	·· 29.2	209 18.5	·· 27.8	66 59.1	·· 11.4	106 45.4	164	· 4 17.7	−129
	10	299 48.2	321 05.4	30.2	55 43.3	29.5	224 20.8	27.8	82 01.6	11.4	121 20.8	164	4 30.6	−129
	11	314 50.7	336 04.9	29.0	70 44.4	29.7	239 23.2	27.8	97 04.1	11.4	135 56.2	164	4 43.5	−129
	12	329 53.2	351 04.4	−10 27.9	85 45.4	−20 30.0	254 25.6	+22 27.8	112 06.5	−12 11.3	150 31.6	164	− 4 56.4	−128
	13	344 55.6	6 03.9	26.7	100 46.5	30.3	269 28.0	27.8	127 09.0	11.3	165 07.0	163	5 09.2	−128
	14	359 58.1	21 03.4	25.6	115 47.5	30.5	284 30.3	27.8	142 11.5	11.3	179 42.3	164	5 22.0	−128
	15	15 00.5	36 02.9	·· 24.4	130 48.6	·· 30.8	299 32.7	·· 27.8	157 14.0	·· 11.3	194 17.7	164	· 5 34.8	−127
	16	30 03.0	51 02.4	23.3	145 49.6	31.1	314 35.1	27.9	172 16.4	11.3	208 53.1	163	5 47.5	−128
	17	45 05.5	66 01.9	22.1	160 50.7	31.3	329 37.5	27.9	187 18.9	11.3	223 28.4	164	6 00.3	−127
	18	60 07.9	81 01.4	−10 20.9	175 51.7	−20 31.6	344 39.8	+22 27.9	202 21.4	−12 11.3	238 03.8	163	− 6 13.0	−127
	19	75 10.4	96 01.0	19.8	190 52.8	31.8	359 42.2	27.9	217 23.9	11.2	252 39.1	163	6 25.7	−126
	20	90 12.9	111 00.5	18.6	205 53.8	32.1	14 44.6	27.9	232 26.3	11.2	267 14.4	163	6 38.3	−126
	21	105 15.3	126 00.0	·· 17.5	220 54.9	·· 32.4	29 46.9	·· 27.9	247 28.8	·· 11.2	281 49.7	163	· 6 50.9	−126
	22	120 17.8	140 59.5	16.3	235 55.9	32.6	44 49.3	28.0	262 31.3	11.2	296 25.0	163	7 03.5	−126
	23	135 20.3	155 59.0	15.1	250 57.0	32.9	59 51.7	28.0	277 33.8	11.2	311 00.3	162	7 16.1	−125
	24	150 22.7	170 58.5	−10 14.0	265 58.0	−20 33.1	74 54.1	+22 28.0	292 36.2	−12 11.2	325 35.5	163	− 7 28.6	−125
code		—	− 5	+ 12	+ 10	− 3	+ 24	0	+ 25	+ 1				

GMT		SUN GHA	Dec.
h		° ′	° ′
18	0	176 28.7	−11 53.7
	1	191 28.8	52.8
	2	206 28.8	51.9
	3	221 28.9 ••	51.0
	4	236 28.9	50.2
	5	251 29.0	49.3
	6	266 29.0	−11 48.4
	7	281 29.1	47.5
	8	296 29.1	46.7
	9	311 29.2 ••	45.8
	10	326 29.2	44.9
	11	341 29.3	44.0
	12	356 29.3	−11 43.1
	13	11 29.4	42.3
	14	26 29.4	41.4
	15	41 29.5 ••	40.5
	16	56 29.5	39.6
	17	71 29.6	38.7
	18	86 29.7	−11 37.8
	19	101 29.7	37.0
	20	116 29.8	36.1
	21	131 29.8 ••	35.2
	22	146 29.9	34.3
	23	161 29.9	33.4
19	0	176 30.0	−11 32.5
	1	191 30.0	31.7
	2	206 30.1	30.8
	3	221 30.2 ••	29.9
	4	236 30.2	29.0
	5	251 30.3	28.1
	6	266 30.3	−11 27.2
	7	281 30.4	26.3
	8	296 30.4	25.5
	9	311 30.5 ••	24.6
	10	326 30.6	23.7
	11	341 30.6	22.8
	12	356 30.7	−11 21.9
	13	11 30.7	21.0
	14	26 30.8	20.1
	15	41 30.9 ••	19.2
	16	56 30.9	18.4
	17	71 31.0	17.5
	18	86 31.0	−11 16.6
	19	101 31.1	15.7
	20	116 31.2	14.8
	21	131 31.2 ••	13.9
	22	146 31.3	13.0
	23	161 31.3	12.1
20	0	176 31.4	−11 11.2
	1	191 31.5	10.3
	2	206 31.5	09.4
	3	221 31.6 ••	08.6
	4	236 31.7	07.7
	5	251 31.7	06.8
	6	266 31.8	−11 05.9
	7	281 31.9	05.0
	8	296 31.9	04.1
	9	311 32.0 ••	03.2
	10	326 32.1	02.3
	11	341 32.1	01.4
	12	356 32.2	−11 00.5
	13	11 32.3	10 59.6
	14	26 32.3	58.7
	15	41 32.4 ••	57.8
	16	56 32.5	56.9
	17	71 32.5	56.0
	18	86 32.6	−10 55.1
	19	101 32.7	54.2
	20	116 32.7	53.3
	21	131 32.8 ••	52.4
	22	146 32.9	51.5
	23	161 32.9	50.6
	24	176 33.0	−10 49.7
code		—	+ 9

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 52.1	−40 29.4
5	Achernar	335 59.9	−57 28.3
30	Acrux	173 58.7	−62 50.7
19	Adhara	255 47.2	−28 54.7
10	Aldebaran	291 40.4	+16 25.2
32	Alioth	166 59.0	+56 12.1
34	Alkaid	153 33.5	+49 32.1
55	Al Na'ir	28 39.8	−47 11.1
15	Alnilam	276 31.3	− 1 13.8
25	Alphard	218 39.4	− 8 27.7
41	Alphecca	126 48.6	+26 51.7
1	Alpheratz	358 29.9	+28 50.3
51	Altair	62 51.9	+ 8 44.6
2	Ankaa	353 59.7	−42 33.4
42	Antares	113 20.9	−26 20.0
37	Arcturus	146 36.1	+19 24.9
43	Atria	109 02.9	−68 56.6
22	Avior	234 35.8	−59 21.9
13	Bellatrix	279 19.6	+ 6 18.6
16	Betelg'se	271 49.3	+ 7 24.0
17	Canopus	264 15.6	−52 40.4
12	Capella	281 40.0	+45 57.4
53	Deneb	50 02.3	+45 06.8
28	Denebola	183 18.6	+14 49.4
4	Diphda	349 40.7	−18 14.3
27	Dubhe	194 45.2	+61 59.7
14	Elnath	279 08.7	+28 34.4
47	Eltanin	91 07.1	+51 29.3
54	Enif	34 31.1	+ 9 39.8
56	Fomalhaut	16 13.2	−29 52.0
31	Gacrux	172 50.2	−56 51.4
29	Gienah	176 37.8	−17 17.4
35	Hadar	149 50.9	−60 09.1
6	Hamal	328 51.2	+23 14.9
48	Kaus Aust.	84 43.0	−34 24.5
40	Kochab	137 17.3	+74 20.1
57	Markab	14 23.0	+14 57.5
8	Menkar	315 01.6	+ 3 54.7
36	Menkent	148 59.9	−36 08.8
24	Miapl'dus	221 48.6	−69 31.8
9	Mirfak	309 44.2	+49 42.3
50	Nunki	76 53.6	−26 21.4
52	Peacock	54 29.6	−56 53.0
21	Pollux	244 21.7	+28 08.3
20	Procyon	245 46.0	+ 5 20.5
46	R'alhague	96 47.8	+12 35.3
26	Regulus	208 30.4	+12 11.3
11	Rigel	281 54.7	− 8 15.3
38	Rigil Kent.	140 52.5	−60 38.8
44	Sabik	103 03.6	−15 40.3
3	Schedar	350 31.9	+56 17.4
45	Shaula	97 22.5	−37 04.3
18	Sirius	259 12.7	−16 39.2
33	Spica	159 18.0	−10 55.5
23	Suhail	223 24.8	−43 15.0
49	Vega	81 09.3	+38 44.1
39	Zub'g'bi	137 54.6	−15 51.3

Lat.	Sunrise	Twlt. begins	Moonrise 18	19	20	21
N °	h m	h m	h m	h m	h m	h m
72	8 33	4 44	17 57	19 50	21 44	23 47
70	8 17	4 51	18 03	19 48	21 33	23 24
68	8 03	4 57	18 08	19 46	21 25	23 06
66	7 52	5 02	18 12	19 45	21 17	22 52
64	7 43	5 05	18 15	19 44	21 11	22 40
62	7 35	5 08	18 18	19 43	21 06	22 30
60	7 28	5 11	18 21	19 42	21 02	22 22
58	7 22	5 13	18 23	19 41	20 58	22 15
56	7 17	5 15	18 25	19 40	20 54	22 08
54	7 12	5 16	18 27	19 40	20 51	22 03
52	7 08	5 17	18 29	19 39	20 48	21 58
50	7 04	5 18	18 30	19 38	20 46	21 53
45	6 56	5 19	18 34	19 37	20 40	21 43
40	6 48	5 19	18 36	19 36	20 35	21 35
35	6 42	5 18	18 39	19 35	20 31	21 28
30	6 37	5 18	18 41	19 35	20 28	21 21
20	6 27	5 14	18 44	19 33	20 22	21 11
10	6 19	5 08	18 47	19 32	20 17	21 02
0	6 11	5 01	18 50	19 31	20 12	20 53
10	6 02	4 50	18 53	19 30	20 07	20 44
20	5 53	4 37	18 57	19 29	20 02	20 35
30	5 43	4 18	19 00	19 28	19 56	20 25
35	5 37	4 06	19 02	19 27	19 53	20 19
40	5 30	3 50	19 04	19 27	19 49	20 12
45	5 22	3 31	19 07	19 26	19 45	20 05
50	5 13	3 04	19 10	19 25	19 40	19 55
52	5 08	2 50	19 12	19 24	19 37	19 51
54	5 03	2 33	19 13	19 24	19 35	19 46
56	4 58	2 13	19 15	19 23	19 32	19 41
58	4 52	1 44	19 17	19 23	19 29	19 35
60	4 45	0 53	19 19	19 22	19 25	19 29
S						

Lat.	Sunset	Twlt. ends	Moonset 18	19	20	21
N °	h m	h m	h m	h m	h m	h m
72	15 56	19 50	7 52	7 26	7 01	6 33
70	16 13	19 43	7 43	7 24	7 06	6 46
68	16 26	19 36	7 36	7 23	7 10	6 57
66	16 37	19 31	7 30	7 22	7 14	7 06
64	16 46	19 27	7 24	7 21	7 17	7 13
62	16 54	19 23	7 20	7 20	7 20	7 20
60	17 00	19 20	7 16	7 19	7 22	7 25
58	17 06	19 18	7 12	7 19	7 24	7 30
56	17 12	19 17	7 09	7 18	7 26	7 35
54	17 16	19 15	7 06	7 17	7 28	7 39
52	17 21	19 14	7 04	7 17	7 30	7 43
50	17 24	19 12	7 01	7 16	7 31	7 46
45	17 33	19 11	6 56	7 16	7 34	7 53
40	17 40	19 11	6 52	7 15	7 37	7 59
35	17 46	19 11	6 48	7 14	7 39	8 05
30	17 52	19 12	6 45	7 13	7 41	8 09
20	18 01	19 15	6 39	7 12	7 45	8 18
10	18 09	19 20	6 34	7 11	7 48	8 25
0	18 17	19 27	6 29	7 10	7 51	8 31
10	18 25	19 37	6 24	7 09	7 54	8 38
20	18 34	19 50	6 19	7 08	7 57	8 45
30	18 44	20 08	6 12	7 07	8 00	8 54
35	18 50	20 20	6 09	7 06	8 02	8 58
40	18 57	20 35	6 05	7 05	8 05	9 04
45	19 05	20 54	6 00	7 04	8 07	9 10
50	19 14	21 20	5 54	7 03	8 11	9 18
52	19 18	21 33	5 52	7 03	8 12	9 21
54	19 23	21 49	5 49	7 02	8 14	9 25
56	19 29	22 10	5 46	7 01	8 16	9 30
58	19 35	22 37	5 42	7 01	8 18	9 34
60	19 42	23 20	5 38	7 00	8 20	9 40
S						

GMT	Equation of Time (App.—Mean) 18	19	20
h	m s	m s	m s
0	−14 05.2	−14 00.2	−13 54.5
6	−14 04.0	−13 58.8	−13 53.0
12	−14 02.8	−13 57.4	−13 51.4
18	−14 01.5	−13 56.0	−13 49.8
24	−14 00.2	−13 54.5	−13 48.1

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
18	0 19	12 34	6 21	19 09	4 41
19	1 00	12 35	6 19	19 05	4 37
20	1 41	12 36	6 17	19 01	4 33
21	2 22	12 37	6 16	18 57	4 29

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
30	0.5	0.1	0.1
45	0.5	0.1	0.1
60	0.5	0.1	0.1
75	0.5	0.0	0.0
90	0.5	0.0	0.0

Moon's Lower Limb Add

Alt.	18	19	20
°	′	′	′
0			
4	12.9	12.4	12.1
8	12.9	12.4	12.1
12	12.9	12.4	12.2
16	12.9	12.4	12.2
20	13.0	12.5	12.2
24	13.0	12.6	12.3
28	13.1	12.6	12.4
32	13.2	12.7	12.5
36	13.2	12.8	12.6
40	13.3	12.9	12.7
44	13.4	13.0	12.8
48	13.5	13.1	12.9
52	13.6	13.3	13.1
56	13.7	13.4	13.2
60	13.9	13.5	13.4
64	14.0	13.7	13.5
68	14.1	13.9	13.7
72	14.3	14.0	13.9
76	14.4	14.2	14.1
80	14.5	14.4	14.3
84	14.7	14.5	14.4
88	14.8	14.7	14.6
90	14.9	14.8	14.8

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	18	19	20
°	′	′	′
0			
4	17.1	17.4	17.5
8	17.1	17.4	17.5
12	17.0	17.3	17.5
16	17.0	17.3	17.4
20	17.0	17.2	17.4
24	16.9	17.2	17.3
28	16.9	17.1	17.2
32	16.8	17.0	17.2
36	16.7	16.9	17.1
40	16.6	16.8	16.9
44	16.5	16.7	16.8
48	16.4	16.6	16.7
52	16.3	16.5	16.6
56	16.2	16.3	16.4
60	16.1	16.2	16.2
64	16.0	16.0	16.1
68	15.8	15.9	15.9
72	15.7	15.7	15.7
76	15.6	15.6	15.6
80	15.4	15.4	15.4
84	15.3	15.2	15.2
88	15.1	15.0	15.0
90	15.0	14.9	14.9

Subtract from table, back cover

GMT		♈ GHA	VENUS −3.4 GHA	VENUS Dec.	MARS 1.0 GHA	MARS Dec.	JUPITER −2.0 GHA	JUPITER Dec.	SATURN 0.7 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
21	0	150 22.7	170 58.5	−10 14.0	265 58.0	−20 33.1	74 54.1	+22 28.0	292 36.2	−12 11.2	325 35.5	163	− 7 28.6	−125
	1	165 25.2	185 58.0	12.8	280 59.1	33.4	89 56.4	28.0	307 38.7	11.2	340 10.8	162	7 41.1	−124
	2	180 27.6	200 57.6	11.7	296 00.1	33.7	104 58.8	28.0	322 41.2	11.1	354 46.0	162	7 53.5	−125
	3	195 30.1	215 57.1	·· 10.5	311 01.2	·· 33.9	120 01.2	·· 28.0	337 43.7	·· 11.1	9 21.2	162	· 8 06.0	−124
	4	210 32.6	230 56.6	09.3	326 02.2	34.2	135 03.5	28.1	352 46.1	11.1	23 56.4	162	8 18.4	−123
	5	225 35.0	245 56.1	08.2	341 03.3	34.4	150 05.9	28.1	7 48.6	11.1	38 31.6	161	8 30.7	−123
	6	240 37.5	260 55.6	−10 07.0	356 04.3	−20 34.7	165 08.3	+22 28.1	22 51.1	−12 11.1	53 06.7	161	− 8 43.0	−123
	7	255 40.0	275 55.1	05.8	11 05.4	35.0	180 10.6	28.1	37 53.6	11.1	67 41.8	161	8 55.3	−123
	8	270 42.4	290 54.6	04.7	26 06.4	35.2	195 13.0	28.1	52 56.1	11.1	82 16.9	161	9 07.6	−122
	9	285 44.9	305 54.2	·· 03.5	41 07.5	·· 35.5	210 15.4	·· 28.1	67 58.5	·· 11.0	96 52.0	161	· 9 19.8	−121
	10	300 47.4	320 53.7	02.4	56 08.5	35.7	225 17.7	28.2	83 01.0	11.0	111 27.1	160	9 31.9	−122
	11	315 49.8	335 53.2	01.2	71 09.6	36.0	240 20.1	28.2	98 03.5	11.0	126 02.1	160	9 44.1	−121
	12	330 52.3	350 52.7	−10 00.0	86 10.6	−20 36.3	255 22.5	+22 28.2	113 06.0	−12 11.0	140 37.1	160	− 9 56.2	−120
	13	345 54.8	5 52.2	9 58.9	101 11.7	36.5	270 24.8	28.2	128 08.4	11.0	155 12.1	159	10 08.2	−120
	14	0 57.2	20 51.8	57.7	116 12.7	36.8	285 27.2	28.2	143 10.9	11.0	169 47.0	159	10 20.2	−120
	15	15 59.7	35 51.3	·· 56.5	131 13.8	·· 37.0	300 29.6	·· 28.2	158 13.4	·· 10.9	184 21.9	159	·10 32.2	−119
	16	31 02.1	50 50.8	55.4	146 14.8	37.3	315 31.9	28.3	173 15.9	10.9	198 56.8	159	10 44.1	−119
	17	46 04.6	65 50.3	54.2	161 15.9	37.5	330 34.3	28.3	188 18.4	10.9	213 31.7	158	10 56.0	−118
	18	61 07.1	80 49.8	− 9 53.0	176 16.9	−20 37.8	345 36.7	+22 28.3	203 20.8	−12 10.9	228 06.5	158	−11 07.8	−118
	19	76 09.5	95 49.4	51.8	191 18.0	38.1	0 39.0	28.3	218 23.3	10.9	242 41.3	157	11 19.6	−118
	20	91 12.0	110 48.9	50.7	206 19.1	38.3	15 41.4	28.3	233 25.8	10.9	257 16.0	158	11 31.4	−117
	21	106 14.5	125 48.4	·· 49.5	221 20.1	·· 38.6	30 43.8	·· 28.3	248 28.3	·· 10.9	271 50.8	156	·11 43.1	−116
	22	121 16.9	140 47.9	48.3	236 21.2	38.8	45 46.1	28.4	263 30.8	10.8	286 25.4	157	11 54.7	−116
	23	136 19.4	155 47.4	47.2	251 22.2	39.1	60 48.5	28.4	278 33.2	10.8	301 00.1	156	12 06.3	−116
22	0	151 21.9	170 47.0	− 9 46.0	266 23.3	−20 39.3	75 50.8	+22 28.4	293 35.7	−12 10.8	315 34.7	156	−12 17.9	−115
	1	166 24.3	185 46.5	44.8	281 24.3	39.6	90 53.2	28.4	308 38.2	10.8	330 09.3	156	12 29.4	−115
	2	181 26.8	200 46.0	43.7	296 25.4	39.9	105 55.6	28.4	323 40.7	10.8	344 43.9	155	12 40.9	−114
	3	196 29.2	215 45.5	·· 42.5	311 26.4	·· 40.1	120 57.9	·· 28.4	338 43.2	·· 10.8	359 18.4	154	·12 52.3	−113
	4	211 31.7	230 45.1	41.3	326 27.5	40.4	136 00.3	28.5	353 45.6	10.7	13 52.8	155	13 03.6	−114
	5	226 34.2	245 44.6	40.1	341 28.5	40.6	151 02.6	28.5	8 48.1	10.7	28 27.3	154	13 15.0	−112
	6	241 36.6	260 44.1	− 9 39.0	356 29.6	−20 40.9	166 05.0	+22 28.5	23 50.6	−12 10.7	43 01.7	153	−13 26.2	−112
	7	256 39.1	275 43.6	37.8	11 30.6	41.1	181 07.4	28.5	38 53.1	10.7	57 36.0	153	13 37.4	−112
	8	271 41.6	290 43.2	36.6	26 31.7	41.4	196 09.7	28.5	53 55.6	10.7	72 10.3	153	13 48.6	−111
	9	286 44.0	305 42.7	·· 35.4	41 32.7	·· 41.6	211 12.1	·· 28.5	68 58.1	·· 10.7	86 44.6	152	·13 59.7	−110
	10	301 46.5	320 42.2	34.3	56 33.8	41.9	226 14.4	28.6	84 00.5	10.6	101 18.8	152	14 10.7	−110
	11	316 49.0	335 41.8	33.1	71 34.9	42.1	241 16.8	28.6	99 03.0	10.6	115 53.0	151	14 21.7	−109
	12	331 51.4	350 41.3	− 9 31.9	86 35.9	−20 42.4	256 19.2	+22 28.6	114 05.5	−12 10.6	130 27.1	151	−14 32.6	−109
	13	346 53.9	5 40.8	30.7	101 37.0	42.6	271 21.5	28.6	129 08.0	10.6	145 01.2	150	14 43.5	−108
	14	1 56.4	20 40.3	29.5	116 38.0	42.9	286 23.9	28.6	144 10.5	10.6	159 35.2	150	14 54.3	−107
	15	16 58.8	35 39.9	·· 28.4	131 39.1	·· 43.1	301 26.2	·· 28.7	159 13.0	·· 10.6	174 09.2	150	·15 05.0	−107
	16	32 01.3	50 39.4	27.2	146 40.1	43.4	316 28.6	28.7	174 15.4	10.5	188 43.2	149	15 15.7	−106
	17	47 03.7	65 38.9	26.0	161 41.2	43.7	331 30.9	28.7	189 17.9	10.5	203 17.1	148	15 26.3	−106
	18	62 06.2	80 38.5	− 9 24.8	176 42.2	−20 43.9	346 33.3	+22 28.7	204 20.4	−12 10.5	217 50.9	148	−15 36.9	−105
	19	77 08.7	95 38.0	23.7	191 43.3	44.2	1 35.6	28.7	219 22.9	10.5	232 24.7	148	15 47.4	−105
	20	92 11.1	110 37.5	22.5	206 44.3	44.4	16 38.0	28.7	234 25.4	10.5	246 58.5	147	15 57.9	−103
	21	107 13.6	125 37.0	·· 21.3	221 45.4	·· 44.7	31 40.4	·· 28.8	249 27.9	·· 10.5	261 32.2	146	·16 08.2	−104
	22	122 16.1	140 36.6	20.1	236 46.5	44.9	46 42.7	28.8	264 30.3	10.4	276 05.8	146	16 18.6	−102
	23	137 18.5	155 36.1	18.9	251 47.5	45.2	61 45.1	28.8	279 32.8	10.4	290 39.4	145	16 28.8	−102
23	0	152 21.0	170 35.6	− 9 17.7	266 48.6	−20 45.4	76 47.4	+22 28.8	294 35.3	−12 10.4	305 12.9	145	−16 39.0	−101
	1	167 23.5	185 35.2	16.6	281 49.6	45.7	91 49.8	28.8	309 37.8	10.4	319 46.4	145	16 49.1	−101
	2	182 25.9	200 34.7	15.4	296 50.7	45.9	106 52.1	28.8	324 40.3	10.4	334 19.9	143	16 59.2	−100
	3	197 28.4	215 34.2	·· 14.2	311 51.7	·· 46.2	121 54.5	·· 28.9	339 42.8	·· 10.4	348 53.2	144	·17 09.2	− 99
	4	212 30.9	230 33.8	13.0	326 52.8	46.4	136 56.8	28.9	354 45.3	10.3	3 26.6	142	17 19.1	− 98
	5	227 33.3	245 33.3	11.8	341 53.9	46.7	151 59.2	28.9	9 47.7	10.3	17 59.8	142	17 28.9	− 98
	6	242 35.8	260 32.8	− 9 10.6	356 54.9	−20 46.9	167 01.5	+22 28.9	24 50.2	−12 10.3	32 33.0	142	−17 38.7	− 97
	7	257 38.2	275 32.4	09.5	11 56.0	47.2	182 03.9	28.9	39 52.7	10.3	47 06.2	141	17 48.4	− 97
	8	272 40.7	290 31.9	08.3	26 57.0	47.4	197 06.2	29.0	54 55.2	10.3	61 39.3	140	17 58.1	− 95
	9	287 43.2	305 31.4	·· 07.1	41 58.1	·· 47.7	212 08.6	·· 29.0	69 57.7	·· 10.3	76 12.3	140	·18 07.6	− 95
	10	302 45.6	320 31.0	05.9	56 59.1	47.9	227 10.9	29.0	85 00.2	10.2	90 45.3	139	18 17.1	− 94
	11	317 48.1	335 30.5	04.7	72 00.2	48.2	242 13.3	29.0	100 02.7	10.2	105 18.2	139	18 26.5	− 94
	12	332 50.6	350 30.1	− 9 03.5	87 01.3	−20 48.4	257 15.6	+22 29.0	115 05.1	−12 10.2	119 51.1	138	−18 35.9	− 92
	13	347 53.0	5 29.6	02.3	102 02.3	48.7	272 18.0	29.0	130 07.6	10.2	134 23.9	137	18 45.1	− 92
	14	2 55.5	20 29.1	01.2	117 03.4	48.9	287 20.3	29.1	145 10.1	10.2	148 56.6	137	18 54.3	− 91
	15	17 58.0	35 28.7	· 9 00.0	132 04.4	·· 49.1	302 22.7	·· 29.1	160 12.6	·· 10.1	163 29.3	136	·19 03.4	− 91
	16	33 00.4	50 28.2	8 58.8	147 05.5	49.4	317 25.0	29.1	175 15.1	10.1	178 01.9	136	19 12.5	− 89
	17	48 02.9	65 27.7	57.6	162 06.5	49.6	332 27.4	29.1	190 17.6	10.1	192 34.5	135	19 21.4	− 89
	18	63 05.3	80 27.3	− 8 56.4	177 07.6	−20 49.9	347 29.7	+22 29.1	205 20.1	−12 10.1	207 07.0	134	−19 30.3	− 88
	19	78 07.8	95 26.8	55.2	192 08.7	50.1	2 32.1	29.2	220 22.6	10.1	221 39.4	134	19 39.1	− 87
	20	93 10.3	110 26.4	54.0	207 09.7	50.4	17 34.4	29.2	235 25.0	10.1	236 11.8	133	19 47.8	− 86
	21	108 12.7	125 25.9	·· 52.8	222 10.8	·· 50.6	32 36.7	·· 29.2	250 27.5	·· 10.0	250 44.1	132	·19 56.4	− 86
	22	123 15.2	140 25.4	51.6	237 11.8	50.9	47 39.1	29.2	265 30.0	10.0	265 16.3	132	20 05.0	− 85
	23	138 17.7	155 25.0	50.4	252 12.9	51.1	62 41.4	29.2	280 32.5	10.0	279 48.5	131	20 13.5	− 84
	24	153 20.1	170 24.5	− 8 49.3	267 14.0	−20 51.4	77 43.8	+22 29.3	295 35.0	−12 10.0	294 20.6	131	−20 21.9	− 83
	code	—	− 5	+ 12	+ 11	− 2	+ 23	0	+ 25	0				

Day	GMT h	SUN GHA ° ′	Dec. ° ′
21	0	176 33.0	−10 49.7
	1	191 33.1	48.8
	2	206 33.1	47.9
	3	221 33.2 ··	47.0
	4	236 33.3	46.1
	5	251 33.4	45.2
	6	266 33.4	−10 44.3
	7	281 33.5	43.4
	8	296 33.6	42.5
	9	311 33.6 ··	41.6
	10	326 33.7	40.7
	11	341 33.8	39.8
	12	356 33.9	−10 38.9
	13	11 33.9	38.0
	14	26 34.0	37.1
	15	41 34.1 ··	36.2
	16	56 34.2	35.3
	17	71 34.2	34.4
	18	86 34.3	−10 33.5
	19	101 34.4	32.6
	20	116 34.4	31.7
	21	131 34.5 ··	30.8
	22	146 34.6	29.9
	23	161 34.7	29.0
22	0	176 34.8	−10 28.1
	1	191 34.8	27.2
	2	206 34.9	26.3
	3	221 35.0 ··	25.4
	4	236 35.1	24.4
	5	251 35.1	23.5
	6	266 35.2	−10 22.6
	7	281 35.3	21.7
	8	296 35.4	20.8
	9	311 35.5 ··	19.9
	10	326 35.5	19.0
	11	341 35.6	18.1
	12	356 35.7	−10 17.2
	13	11 35.8	16.3
	14	26 35.8	15.4
	15	41 35.9 ··	14.5
	16	56 36.0	13.5
	17	71 36.1	12.6
	18	86 36.2	−10 11.7
	19	101 36.3	10.8
	20	116 36.3	09.9
	21	131 36.4 ··	09.0
	22	146 36.5	08.1
	23	161 36.6	07.2
23	0	176 36.7	−10 06.2
	1	191 36.7	05.3
	2	206 36.8	04.4
	3	221 36.9 ··	03.5
	4	236 37.0	02.6
	5	251 37.1	01.7
	6	266 37.2	−10 00.8
	7	281 37.2	9 59.9
	8	296 37.3	58.9
	9	311 37.4 ··	58.0
	10	326 37.5	57.1
	11	341 37.6	56.2
	12	356 37.7	− 9 55.3
	13	11 37.8	54.4
	14	26 37.8	53.4
	15	41 37.9 ··	52.5
	16	56 38.0	51.6
	17	71 38.1	50.7
	18	86 38.2	− 9 49.8
	19	101 38.3	48.9
	20	116 38.4	47.9
	21	131 38.5 ··	47.0
	22	146 38.5	46.1
	23	161 38.6	45.2
	24	176 38.7	− 9 44.3
	code	—	+ 9

No.	STARS Name	SHA ° ′	Dec. ° ′
7	Acamar	315 52.1	−40 29.4
5	Achernar	335 59.9	−57 28.3
30	Acrux	173 58.7	−62 50.7
19	Adhara	255 47.2	−28 54.7
10	Aldebaran	291 40.4	+16 25.2
32	Alioth	166 59.0	+56 12.1
34	Alkaid	153 33.4	+49 32.1
55	Al Na'ir	28 39.8	−47 11.1
15	Alnilam	276 31.4	− 1 13.8
25	Alphard	218 39.4	− 8 27.7
41	Alphecca	126 48.5	+26 51.7
1	Alpheratz	358 29.9	+28 50.3
51	Altair	62 51.8	+ 8 44.6
2	Ankaa	353 59.7	−42 33.4
42	Antares	113 20.9	−26 20.0
37	Arcturus	146 36.1	+19 24.9
43	Atria	109 02.8	−68 56.6
22	Avior	234 35.8	−59 21.9
13	Bellatrix	279 19.6	+ 6 18.6
16	Betelg'se	271 49.3	+ 7 24.0
17	Canopus	264 15.6	−52 40.4
12	Capella	281 40.0	+45 57.4
53	Deneb	50 02.3	+45 06.8
28	Denebola	183 18.6	+14 49.4
4	Diphda	349 40.7	−18 14.3
27	Dubhe	194 45.2	+61 59.7
14	Elnath	279 08.7	+28 34.4
47	Eltanin	91 07.0	+51 29.3
54	Enif	34 31.1	+ 9 39.8
56	Fomalhaut	16 13.2	−29 52.0
31	Gacrux	172 50.2	−56 51.4
29	Gienah	176 37.8	−17 17.4
35	Hadar	149 50.9	−60 09.1
6	Hamal	328 51.2	+23 14.9
48	Kaus Aust.	84 42.9	−34 24.5
40	Kochab	137 17.2	+74 20.1
57	Markab	14 23.0	+14 57.5
8	Menkar	315 01.6	+ 3 54.7
36	Menkent	148 59.9	−36 08.8
24	Miapl'dus	221 48.6	−69 31.8
9	Mirfak	309 44.2	+49 42.3
50	Nunki	76 53.6	−26 21.4
52	Peacock	54 29.6	−56 53.0
21	Pollux	244 21.7	+28 08.3
20	Procyon	245 46.0	+ 5 20.5
46	R'alhague	96 47.8	+12 35.3
26	Regulus	208 30.4	+12 11.3
11	Rigel	281 54.7	− 8 15.3
38	Rigil Kent.	140 52.4	−60 38.8
44	Sabik	103 03.6	−15 40.3
3	Schedar	350 31.9	+56 17.4
45	Shaula	97 22.4	−37 04.3
18	Sirius	259 12.7	−16 39.2
33	Spica	159 17.9	−10 55.6
23	Suhail	223 24.8	−43 15.0
49	Vega	81 09.3	+38 44.1
39	Zub'g'bi	137 54.6	−15 51.3

Lat. °	Sunrise h m	Twlt. begins h m	Moonrise 21 h m	22 h m	23 h m	24 h m
N 72	8 17	4 29	23 47	26 31	2 31	■
70	8 02	4 38	23 24	25 31	1 31	■
68	7 51	4 46	23 06	24 56	0 56	3 12
66	7 41	4 52	22 52	24 31	0 31	2 21
64	7 33	4 56	22 40	24 12	0 12	1 49
62	7 26	5 00	22 30	23 57	25 26	1 26
60	7 20	5 03	22 22	23 44	25 08	1 08
58	7 15	5 05	22 15	23 33	24 52	0 52
56	7 10	5 07	22 08	23 23	24 39	0 39
54	7 06	5 10	22 03	23 15	24 28	0 28
52	7 02	5 11	21 58	23 07	24 18	0 18
50	6 58	5 12	21 53	23 01	24 09	0 09
45	6 51	5 14	21 43	22 46	23 50	24 53
40	6 44	5 16	21 35	22 34	23 35	24 35
35	6 39	5 15	21 28	22 24	23 22	24 20
30	6 34	5 15	21 21	22 16	23 11	24 07
20	6 25	5 12	21 11	22 01	22 52	23 45
10	6 18	5 07	21 02	21 47	22 35	23 25
0	6 10	5 00	20 53	21 35	22 20	23 07
10	6 03	4 52	20 44	21 23	22 05	22 49
20	5 55	4 38	20 35	21 10	21 48	22 30
30	5 45	4 21	20 25	20 56	21 30	22 08
35	5 40	4 09	20 19	20 47	21 19	21 56
40	5 34	3 54	20 12	20 38	21 07	21 41
45	5 26	3 37	20 05	20 27	20 52	21 24
50	5 18	3 12	19 55	20 13	20 35	21 02
52	5 14	2 59	19 51	20 07	20 27	20 52
54	5 09	2 44	19 46	20 00	20 18	20 41
56	5 04	2 25	19 41	19 53	20 07	20 28
58	4 59	2 01	19 35	19 44	19 55	20 12
S 60	4 52	1 25	19 29	19 34	19 42	19 55

Lat. °	Sunset h m	Twlt. ends h m	Moonset 21 h m	22 h m	23 h m	24 h m
N 72	16 12	20 05	6 33	5 57	4 43	■
70	16 26	19 54	6 46	6 22	5 44	■
68	16 38	19 47	6 57	6 41	6 20	5 38
66	16 47	19 40	7 06	6 57	6 46	6 30
64	16 55	19 35	7 13	7 09	7 06	7 02
62	17 02	19 31	7 20	7 20	7 22	7 26
60	17 08	19 27	7 25	7 30	7 36	7 45
58	17 13	19 24	7 30	7 38	7 47	8 01
56	17 18	19 22	7 35	7 45	7 58	8 15
54	17 22	19 20	7 39	7 51	8 07	8 27
52	17 26	19 19	7 43	7 57	8 15	8 37
50	17 30	19 18	7 46	8 03	8 22	8 46
45	17 37	19 15	7 53	8 14	8 38	9 06
40	17 43	19 13	7 59	8 24	8 51	9 22
35	17 49	19 13	8 05	8 32	9 02	9 36
30	17 54	19 14	8 09	8 39	9 11	9 48
20	18 02	19 16	8 18	8 52	9 28	10 08
10	18 10	19 21	8 25	9 03	9 43	10 26
0	18 17	19 27	8 31	9 13	9 56	10 42
10	18 24	19 35	8 38	9 23	10 10	10 59
20	18 32	19 48	8 45	9 35	10 25	11 17
30	18 41	20 04	8 54	9 47	10 42	11 38
35	18 47	20 16	8 58	9 55	10 52	11 50
40	18 53	20 30	9 04	10 03	11 03	12 04
45	19 00	20 48	9 10	10 13	11 17	12 21
50	19 08	21 12	9 18	10 25	11 33	12 41
52	19 12	21 24	9 21	10 31	11 41	12 51
54	19 17	21 39	9 25	10 37	11 50	13 02
56	19 22	21 57	9 30	10 44	11 59	13 15
58	19 27	22 20	9 34	10 52	12 11	13 29
S 60	19 33	22 52	9 40	11 01	12 23	13 47

GMT h	Equation of Time (App.—Mean) 21 m s	22 m s	23 m s
0	−13 48.1	−13 41.1	−13 33.5
6	−13 46.5	−13 39.3	−13 31.5
12	−13 44.7	−13 37.4	−13 29.5
18	−13 43.0	−13 35.5	−13 27.4
24	−13 41.1	−13 33.5	−13 25.3

GMT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
21	2 22	12 37	6 16	18 57	4 29
22	3 03	12 37	6 14	18 54	4 25
23	3 46	12 38	6 12	18 50	4 21
24	4 31	12 39	6 11	18 46	4 17

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0			
	0.5	0.1	0.1
30			
	0.5	0.1	0.1
45			
	0.5	0.1	0.1
60			
	0.5	0.0	0.0
75			
	0.5	0.0	0.0
90			

Moon's Lower Limb
Add

Alt. °	21 ′	22 ′	23 ′
0			
	11.9	11.9	12.0
4			
	11.9	11.9	12.0
8			
	11.9	11.9	12.0
12			
	11.9	11.9	12.1
16			
	12.0	12.0	12.1
20			
	12.1	12.1	12.2
24			
	12.2	12.2	12.3
28			
	12.2	12.2	12.4
32			
	12.4	12.4	12.5
36			
	12.5	12.5	12.6
40			
	12.6	12.6	12.7
44			
	12.7	12.7	12.8
48			
	12.9	12.9	13.0
52			
	13.1	13.1	13.1
56			
	13.2	13.2	13.3
60			
	13.4	13.4	13.5
64			
	13.6	13.6	13.6
68			
	13.8	13.8	13.8
72			
	14.0	14.0	14.0
76			
	14.2	14.2	14.2
80			
	14.4	14.4	14.4
84			
	14.6	14.6	14.6
88			
	14.7	14.7	14.7
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt. °	21 ′	22 ′	23 ′
0			
	17.7	17.7	17.6
4			
	17.6	17.6	17.6
8			
	17.6	17.6	17.5
12			
	17.6	17.6	17.5
16			
	17.5	17.5	17.5
20			
	17.5	17.5	17.4
24			
	17.4	17.4	17.3
28			
	17.3	17.3	17.2
32			
	17.2	17.2	17.1
36			
	17.0	17.0	17.0
40			
	16.9	16.9	16.9
44			
	16.8	16.8	16.7
48			
	16.6	16.6	16.6
52			
	16.5	16.5	16.4
56			
	16.3	16.3	16.3
60			
	16.1	16.1	16.1
64			
	15.9	15.9	15.9
68			
	15.8	15.8	15.7
72			
	15.6	15.6	15.6
76			
	15.4	15.4	15.4
80			
	15.2	15.2	15.2
84			
	15.0	15.0	15.0
88			
	14.8	14.8	14.8
90			

Subtract from table, back cover

Washington's Birthday 22

992941°—53——3

GMT	♈ GHA	VENUS −3.4 GHA	VENUS Dec.	MARS 0.8 GHA	MARS Dec.	JUPITER −1.9 GHA	JUPITER Dec.	SATURN 0.6 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
24 0	153 20.1	170 24.5	−8 49.3	267 14.0	−20 51.4	77 43.8	+22 29.3	295 35.0	−12 10.0	294 20.6	131	−20 21.9	−83
1	168 22.6	185 24.1	48.1	282 15.0	51.6	92 46.1	29.3	310 37.5	10.0	308 52.7	129	20 30.2	−82
2	183 25.1	200 23.6	46.9	297 16.1	51.9	107 48.5	29.3	325 40.0	09.9	323 24.6	130	20 38.4	−81
3	198 27.5	215 23.2	45.7	312 17.1	52.1	122 50.8	29.3	340 42.5	09.9	337 56.6	128	20 46.5	−80
4	213 30.0	230 22.7	44.5	327 18.2	52.3	137 53.2	29.3	355 45.0	09.9	352 28.4	128	20 54.5	−80
5	228 32.5	245 22.2	43.3	342 19.3	52.6	152 55.5	29.3	10 47.4	09.9	7 00.2	127	21 02.5	−79
6	243 34.9	260 21.8	−8 42.1	357 20.3	−20 52.8	167 57.8	+22 29.4	25 49.9	−12 09.9	21 31.9	127	−21 10.4	−77
7	258 37.4	275 21.3	40.9	12 21.4	53.1	183 00.2	29.4	40 52.4	09.9	36 03.6	125	21 18.1	−77
8	273 39.8	290 20.9	39.7	27 22.4	53.3	198 02.5	29.4	55 54.9	09.8	50 35.1	126	21 25.8	−76
9	288 42.3	305 20.4	38.5	42 23.5	53.6	213 04.9	29.4	70 57.4	09.8	65 06.7	124	21 33.4	−75
10	303 44.8	320 20.0	37.3	57 24.6	53.8	228 07.2	29.4	85 59.9	09.8	79 38.1	124	21 40.9	−74
11	318 47.2	335 19.5	36.1	72 25.6	54.1	243 09.5	29.5	101 02.4	09.8	94 09.5	123	21 48.3	−73
12	333 49.7	350 19.0	−8 34.9	87 26.7	−20 54.3	258 11.9	+22 29.5	116 04.9	−12 09.8	108 40.8	122	−21 55.6	−72
13	348 52.2	5 18.6	33.7	102 27.7	54.5	273 14.2	29.5	131 07.4	09.7	123 12.0	122	22 02.8	−72
14	3 54.6	20 18.1	32.5	117 28.8	54.8	288 16.6	29.5	146 09.9	09.7	137 43.2	121	22 10.0	−70
15	18 57.1	35 17.7	31.3	132 29.9	55.0	303 18.9	29.5	161 12.4	09.7	152 14.3	120	22 17.0	−69
16	33 59.6	50 17.2	30.1	147 30.9	55.3	318 21.2	29.5	176 14.8	09.7	166 45.3	120	22 23.9	−68
17	49 02.0	65 16.8	28.9	162 32.0	55.5	333 23.6	29.6	191 17.3	09.7	181 16.3	119	22 30.7	−68
18	64 04.5	80 16.3	−8 27.7	177 33.0	−20 55.8	348 25.9	+22 29.6	206 19.8	−12 09.6	195 47.2	118	−22 37.5	−66
19	79 06.9	95 15.9	26.5	192 34.1	56.0	3 28.3	29.6	221 22.3	09.6	210 18.0	118	22 44.1	−65
20	94 09.4	110 15.4	25.3	207 35.2	56.2	18 30.6	29.6	236 24.8	09.6	224 48.8	117	22 50.6	−65
21	109 11.9	125 15.0	24.1	222 36.2	56.5	33 32.9	29.6	251 27.3	09.6	239 19.5	116	22 57.1	−63
22	124 14.3	140 14.5	22.9	237 37.3	56.7	48 35.3	29.7	266 29.8	09.6	253 50.1	116	23 03.4	−62
23	139 16.8	155 14.1	21.7	252 38.4	57.0	63 37.6	29.7	281 32.3	09.5	268 20.7	115	23 09.6	−62
25 0	154 19.3	170 13.6	−8 20.5	267 39.4	−20 57.2	78 39.9	+22 29.7	296 34.8	−12 09.5	282 51.2	114	−23 15.8	−60
1	169 21.7	185 13.2	19.3	282 40.5	57.4	93 42.3	29.7	311 37.3	09.5	297 21.6	113	23 21.8	−59
2	184 24.2	200 12.7	18.1	297 41.5	57.7	108 44.6	29.7	326 39.8	09.5	311 51.9	113	23 27.7	−58
3	199 26.7	215 12.3	16.9	312 42.6	57.9	123 46.9	29.8	341 42.3	09.5	326 22.2	112	23 33.5	−57
4	214 29.1	230 11.8	15.7	327 43.7	58.2	138 49.3	29.8	356 44.8	09.4	340 52.4	112	23 39.2	−56
5	229 31.6	245 11.4	14.5	342 44.7	58.4	153 51.6	29.8	11 47.3	09.4	355 22.6	111	23 44.8	−55
6	244 34.1	260 10.9	−8 13.3	357 45.8	−20 58.6	168 53.9	+22 29.8	26 49.7	−12 09.4	9 52.7	110	−23 50.3	−54
7	259 36.5	275 10.5	12.1	12 46.9	58.9	183 56.3	29.8	41 52.2	09.4	24 22.7	109	23 55.7	−52
8	274 39.0	290 10.0	10.9	27 47.9	59.1	198 58.6	29.9	56 54.7	09.4	38 52.6	109	24 00.9	−52
9	289 41.4	305 09.6	09.7	42 49.0	59.4	214 00.9	29.9	71 57.2	09.3	53 22.5	108	24 06.1	−50
10	304 43.9	320 09.1	08.5	57 50.0	59.6	229 03.3	29.9	86 59.7	09.3	67 52.3	107	24 11.1	−49
11	319 46.4	335 08.7	07.3	72 51.1	20 59.8	244 05.6	29.9	102 02.2	09.3	82 22.0	107	24 16.0	−49
12	334 48.8	350 08.2	−8 06.1	87 52.2	−21 00.1	259 07.9	+22 29.9	117 04.7	−12 09.3	96 51.7	106	−24 20.9	−47
13	349 51.3	5 07.8	04.9	102 53.2	00.3	274 10.3	30.0	132 07.2	09.3	111 21.3	106	24 25.6	−46
14	4 53.8	20 07.3	03.7	117 54.3	00.6	289 12.6	30.0	147 09.7	09.2	125 50.9	105	24 30.2	−44
15	19 56.2	35 06.9	02.5	132 55.4	00.8	304 14.9	30.0	162 12.2	09.2	140 20.4	104	24 34.6	−44
16	34 58.7	50 06.5	01.3	147 56.4	01.0	319 17.3	30.0	177 14.7	09.2	154 49.8	103	24 39.0	−42
17	50 01.2	65 06.0	8 00.0	162 57.5	01.3	334 19.6	30.0	192 17.2	09.2	169 19.1	103	24 43.2	−41
18	65 03.6	80 05.6	−7 58.8	177 58.6	−21 01.5	349 21.9	+22 30.1	207 19.7	−12 09.2	183 48.4	102	−24 47.3	−40
19	80 06.1	95 05.1	57.6	192 59.6	01.7	4 24.3	30.1	222 22.2	09.1	198 17.6	102	24 51.3	−39
20	95 08.6	110 04.7	56.4	208 00.7	02.0	19 26.6	30.1	237 24.7	09.1	212 46.8	101	24 55.2	−38
21	110 11.0	125 04.2	55.2	223 01.8	02.2	34 28.9	30.1	252 27.2	09.1	227 15.9	100	24 59.0	−36
22	125 13.5	140 03.8	54.0	238 02.8	02.4	49 31.2	30.1	267 29.7	09.1	241 44.9	100	25 02.6	−35
23	140 15.9	155 03.3	52.8	253 03.9	02.7	64 33.6	30.2	282 32.2	09.1	256 13.9	99	25 06.1	−34
26 0	155 18.4	170 02.9	−7 51.6	268 05.0	−21 02.9	79 35.9	+22 30.2	297 34.7	−12 09.0	270 42.8	98	−25 09.5	−33
1	170 20.9	185 02.5	50.4	283 06.0	03.2	94 38.2	30.2	312 37.2	09.0	285 11.6	98	25 12.8	−32
2	185 23.3	200 02.0	49.2	298 07.1	03.4	109 40.5	30.2	327 39.7	09.0	299 40.4	97	25 16.0	−30
3	200 25.8	215 01.6	47.9	313 08.2	03.6	124 42.9	30.2	342 42.2	09.0	314 09.1	97	25 19.0	−29
4	215 28.3	230 01.1	46.7	328 09.2	03.9	139 45.2	30.3	357 44.7	09.0	328 37.8	96	25 21.9	−28
5	230 30.7	245 00.7	45.5	343 10.3	04.1	154 47.5	30.3	12 47.2	08.9	343 06.4	96	25 24.7	−26
6	245 33.2	260 00.3	−7 44.3	358 11.4	−21 04.3	169 49.8	+22 30.3	27 49.7	−12 08.9	357 35.0	95	−25 27.3	−25
7	260 35.7	274 59.8	43.1	13 12.4	04.6	184 52.2	30.3	42 52.2	08.9	12 03.5	94	25 29.8	−24
8	275 38.1	289 59.4	41.9	28 13.5	04.8	199 54.5	30.3	57 54.7	08.9	26 31.9	94	25 32.2	−23
9	290 40.6	304 58.9	40.7	43 14.6	05.0	214 56.8	30.4	72 57.2	08.8	41 00.3	93	25 34.5	−21
10	305 43.1	319 58.5	39.5	58 15.6	05.3	229 59.1	30.4	87 59.7	08.8	55 28.6	93	25 36.6	−20
11	320 45.5	334 58.1	38.2	73 16.7	05.5	245 01.5	30.4	103 02.2	08.8	69 56.9	92	25 38.6	−19
12	335 48.0	349 57.6	−7 37.0	88 17.8	−21 05.7	260 03.8	+22 30.4	118 04.7	−12 08.8	84 25.1	92	−25 40.5	−17
13	350 50.4	4 57.2	35.8	103 18.8	06.0	275 06.1	30.4	133 07.2	08.8	98 53.3	91	25 42.2	−16
14	5 52.9	19 56.7	34.6	118 19.9	06.2	290 08.4	30.5	148 09.7	08.7	113 21.4	91	25 43.8	−15
15	20 55.4	34 56.3	33.4	133 21.0	06.4	305 10.8	30.5	163 12.2	08.7	127 49.5	90	25 45.3	−13
16	35 57.8	49 55.9	32.2	148 22.0	06.7	320 13.1	30.5	178 14.7	08.7	142 17.5	89	25 46.6	−13
17	51 00.3	64 55.4	31.0	163 23.1	06.9	335 15.4	30.5	193 17.2	08.7	156 45.4	90	25 47.9	−10
18	66 02.8	79 55.0	−7 29.7	178 24.2	−21 07.1	350 17.7	+22 30.5	208 19.7	−12 08.6	171 13.4	88	−25 48.9	−10
19	81 05.2	94 54.6	28.5	193 25.2	07.4	5 20.0	30.6	223 22.2	08.6	185 41.2	89	25 49.9	−8
20	96 07.7	109 54.1	27.3	208 26.3	07.6	20 22.4	30.6	238 24.7	08.6	200 09.1	87	25 50.7	−6
21	111 10.2	124 53.7	26.1	223 27.4	07.8	35 24.7	30.6	253 27.2	08.6	214 36.8	88	25 51.3	−6
22	126 12.6	139 53.2	24.9	238 28.5	08.1	50 27.0	30.6	268 29.7	08.6	229 04.6	87	25 51.9	−4
23	141 15.1	154 52.8	23.6	253 29.5	08.3	65 29.3	30.6	283 32.2	08.5	243 32.3	86	25 52.3	−2
24	156 17.6	169 52.4	−7 22.4	268 30.6	−21 08.5	80 31.6	+22 30.7	298 34.7	−12 08.5	257 59.9	86	−25 52.5	−1
code	—	−4	+12	+10	−2	+24	+1	+25	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
24 0	176 38.7	− 9 44.3
1	191 38.8	43.3
2	206 38.9	42.4
3	221 39.0	·· 41.5
4	236 39.1	40.6
5	251 39.2	39.7
6	266 39.3	− 9 38.7
7	281 39.4	37.8
8	296 39.4	36.9
9	311 39.5	·· 36.0
10	326 39.6	35.1
11	341 39.7	34.1
12	356 39.8	− 9 33.2
13	11 39.9	32.3
14	26 40.0	31.4
15	41 40.1	·· 30.5
16	56 40.2	29.5
17	71 40.3	28.6
18	86 40.4	− 9 27.7
19	101 40.5	26.8
20	116 40.6	25.8
21	131 40.7	·· 24.9
22	146 40.7	24.0
23	161 40.8	23.1
25 0	176 40.9	− 9 22.1
1	191 41.0	21.2
2	206 41.1	20.3
3	221 41.2	·· 19.4
4	236 41.3	18.4
5	251 41.4	17.5
6	266 41.5	− 9 16.6
7	281 41.6	15.7
8	296 41.7	14.7
9	311 41.8	·· 13.8
10	326 41.9	12.9
11	341 42.0	11.9
12	356 42.1	− 9 11.0
13	11 42.2	10.1
14	26 42.3	09.2
15	41 42.4	·· 08.2
16	56 42.5	07.3
17	71 42.6	06.4
18	86 42.7	− 9 05.4
19	101 42.8	04.5
20	116 42.9	03.6
21	131 43.0	·· 02.7
22	146 43.1	01.7
23	161 43.2	9 00.8
26 0	176 43.3	− 8 59.9
1	191 43.4	58.9
2	206 43.5	58.0
3	221 43.6	·· 57.1
4	236 43.7	56.1
5	251 43.8	55.2
6	266 43.9	− 8 54.3
7	281 44.0	53.3
8	296 44.1	52.4
9	311 44.2	·· 51.5
10	326 44.3	50.5
11	341 44.4	49.6
12	356 44.5	− 8 48.7
13	11 44.6	47.7
14	26 44.7	46.8
15	41 44.8	·· 45.9
16	56 44.9	44.9
17	71 45.0	44.0
18	86 45.1	− 8 43.1
19	101 45.3	42.1
20	116 45.4	41.2
21	131 45.5	·· 40.3
22	146 45.6	39.3
23	161 45.7	38.4
24	176 45.8	− 8 37.5
code	—	+ 9

No.	Name	STARS SHA	Dec.
		° ′	° ′
7	Acamar	315 52.1	−40 29.4
5	Achernar	336 00.0	−57 28.3
30	Acrux	173 58.7	−62 50.7
19	Adhara	255 47.2	−28 54.7
10	Aldebaran	291 40.4	+16 25.2
32	Alioth	166 59.0	+56 12.2
34	Alkaid	153 33.4	+49 32.1
55	Al Na'ir	28 39.8	−47 11.0
15	Alnilam	276 31.4	− 1 13.8
25	Alphard	218 39.4	− 8 27.7
41	Alphecca	126 48.5	+26 51.7
1	Alpheratz	358 29.9	+28 50.3
51	Altair	62 51.8	+ 8 44.6
2	Ankaa	353 59.7	−42 33.4
42	Antares	113 20.8	−26 20.0
37	Arcturus	146 36.0	+19 24.9
43	Atria	109 02.7	−68 56.6
22	Avior	234 35.8	−59 21.9
13	Bellatrix	279 19.6	+ 6 18.6
16	Betelg'se	271 49.3	+ 7 24.0
17	Canopus	264 15.6	−52 40.4
12	Capella	281 40.1	+45 57.4
53	Deneb	50 02.3	+45 06.8
28	Denebola	183 18.6	+14 49.4
4	Diphda	349 40.7	−18 14.3
27	Dubhe	194 45.2	+61 59.7
14	Elnath	279 08.7	+28 34.4
47	Eltanin	91 07.0	+51 29.2
54	Enif	34 31.1	+ 9 39.8
56	Fomalhaut	16 13.2	−29 52.0
31	Gacrux	172 50.2	−56 51.4
29	Gienah	176 37.8	−17 17.4
35	Hadar	149 50.9	−60 09.1
6	Hamal	328 51.2	+23 14.9
48	Kaus Aust.	84 42.9	−34 24.5
40	Kochab	137 17.2	+74 20.1
57	Markab	14 23.0	+14 57.5
8	Menkar	315 01.7	+ 3 54.7
36	Menkent	148 59.9	−36 08.8
24	Miapl'dus	221 48.6	−69 31.9
9	Mirfak	309 44.2	+49 42.3
50	Nunki	76 53.6	−26 21.4
52	Peacock	54 29.6	−56 53.0
21	Pollux	244 21.7	+28 08.3
20	Procyon	245 46.0	+ 5 20.5
46	R'alhague	96 47.8	+12 35.3
26	Regulus	208 30.4	+12 11.3
11	Rigel	281 54.7	− 8 15.3
38	Rigil Kent.	140 52.4	−60 38.8
44	Sabik	103 03.6	−15 40.3
3	Schedar	350 31.9	+56 17.4
45	Shaula	97 22.4	−37 04.3
18	Sirius	259 12.7	−16 39.3
33	Spica	159 17.9	−10 55.6
23	Suhail	223 24.8	−43 15.0
49	Vega	81 09.3	+38 44.1
39	Zub'g'bi	137 54.6	−15 51.3

Lat.	Sunrise	Twlt. begins	Moonrise 24	25	26	27
°	h m	h m	h m	h m	h m	h m
N 72	8 01	4 14	■	■	■	■
70	7 48	4 25	■	■	■	■
68	7 38	4 34	3 12	■	■	■
66	7 30	4 41	2 21	4 49	■	■
64	7 23	4 46	1 49	3 32	5 22	6 48
62	7 17	4 51	1 26	2 56	4 21	5 25
60	7 12	4 55	1 08	2 30	3 47	4 49
58	7 07	4 59	0 52	2 10	3 23	4 22
56	7 03	5 01	0 39	1 53	3 03	4 02
54	6 59	5 03	0 28	1 39	2 46	3 45
52	6 56	5 05	0 18	1 27	2 32	3 30
50	6 53	5 07	0 09	1 16	2 20	3 17
45	6 46	5 09	24 53	0 53	1 55	2 51
40	6 40	5 12	24 35	0 35	1 34	2 30
35	6 35	5 12	24 20	0 20	1 18	2 13
30	6 31	5 12	24 07	0 07	1 03	1 58
20	6 23	5 10	23 45	24 38	0 38	1 33
10	6 16	5 07	23 25	24 17	0 17	1 11
0	6 10	5 00	23 07	23 58	24 50	0 50
10	6 03	4 52	22 49	23 38	24 30	0 30
20	5 56	4 41	22 30	23 17	24 08	0 08
30	5 48	4 24	22 08	22 53	23 43	24 39
35	5 43	4 13	21 56	22 38	23 28	24 25
40	5 37	4 00	21 41	22 22	23 11	24 08
45	5 31	3 42	21 24	22 03	22 50	23 48
50	5 23	3 19	21 02	21 38	22 24	23 23
52	5 19	3 08	20 52	21 26	22 12	23 11
54	5 15	2 54	20 41	21 13	21 57	22 57
56	5 11	2 38	20 28	20 57	21 41	22 41
58	5 06	2 17	20 12	20 39	21 20	22 21
60 S	5 00	1 49	19 55	20 16	20 55	21 57

Lat.	Sunset	Twlt. ends	Moonset 24	25	26	27
°	h m	h m	h m	h m	h m	h m
N 72	16 28	20 19	■	■	■	■
70	16 40	20 08	■	■	■	■
68	16 50	19 58	5 38	■	■	■
66	16 58	19 51	6 30	5 41	■	■
64	17 05	19 45	7 02	6 59	6 55	7 19
62	17 11	19 40	7 26	7 35	7 56	8 42
60	17 16	19 35	7 45	8 01	8 30	9 19
58	17 21	19 32	8 01	8 22	8 55	9 45
56	17 25	19 29	8 15	8 39	9 14	10 05
54	17 28	19 26	8 27	8 53	9 31	10 23
52	17 32	19 24	8 37	9 06	9 45	10 37
50	17 35	19 23	8 46	9 17	9 58	10 50
45	17 41	19 19	9 06	9 41	10 24	11 16
40	17 47	19 17	9 22	9 59	10 44	11 37
35	17 52	19 16	9 36	10 15	11 01	11 54
30	17 56	19 16	9 48	10 29	11 16	12 09
20	18 04	19 18	10 08	10 52	11 41	12 34
10	18 10	19 20	10 26	11 12	12 02	12 56
0	18 17	19 27	10 42	11 31	12 23	13 16
10	18 23	19 34	10 59	11 50	12 43	13 37
20	18 30	19 45	11 17	12 10	13 04	13 58
30	18 38	20 01	11 38	12 34	13 30	14 23
35	18 43	20 11	11 50	12 48	13 44	14 38
40	18 48	20 24	12 04	13 04	13 58	14 55
45	18 55	20 41	12 21	13 23	14 22	15 15
50	19 02	21 03	12 41	13 47	14 48	15 41
52	19 06	21 15	12 51	13 59	15 00	15 53
54	19 10	21 28	13 02	14 12	15 15	16 07
56	19 14	21 44	13 15	14 27	15 31	16 24
58	19 19	22 04	13 29	14 45	15 52	16 43
60 S	19 24	22 30	13 47	15 07	16 17	17 08

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.5	0.1	0.1
30			
	0.5	0.1	0.1
45			
	0.5	0.1	0.1
60			
	0.5	0.0	0.0
75			
	0.5	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	24	25	26
°	′	′	′
0			
	12.4	12.9	13.6
4			
	12.4	12.9	13.7
8			
	12.4	12.9	13.7
12			
	12.4	12.9	13.7
16			
	12.5	13.0	13.7
20			
	12.6	13.0	13.8
24			
	12.6	13.1	13.8
28			
	12.7	13.2	13.8
32			
	12.8	13.2	13.9
36			
	12.9	13.3	14.0
40			
	13.0	13.4	14.0
44			
	13.1	13.5	14.1
48			
	13.3	13.6	14.2
52			
	13.4	13.7	14.3
56			
	13.5	13.9	14.3
60			
	13.7	14.0	14.4
64			
	13.9	14.1	14.5
68			
	14.0	14.3	14.6
72			
	14.2	14.4	14.7
76			
	14.4	14.5	14.8
80			
	14.5	14.7	14.9
84			
	14.7	14.8	15.0
88			
	14.8	14.9	15.1
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	24	25	26
°	′	′	′
0			
	17.4	17.1	16.6
4			
	17.4	17.1	16.6
8			
	17.3	17.0	16.6
12			
	17.3	17.0	16.6
16			
	17.2	17.0	16.6
20			
	17.2	16.9	16.5
24			
	17.1	16.9	16.5
28			
	17.0	16.8	16.4
32			
	16.9	16.7	16.4
36			
	16.8	16.6	16.3
40			
	16.7	16.5	16.3
44			
	16.6	16.4	16.2
48			
	16.5	16.3	16.1
52			
	16.3	16.2	16.0
56			
	16.2	16.1	15.9
60			
	16.0	16.0	15.8
64			
	15.9	15.8	15.8
68			
	15.7	15.7	15.7
72			
	15.6	15.6	15.6
76			
	15.4	15.4	15.5
80			
	15.2	15.3	15.4
84			
	15.0	15.1	15.2
88			
	14.9	15.0	15.2
90			

Subtract from table, back cover

Equation of Time (App.—Mean)

GMT	24	25	26
h	m s	m s	m s
0	−13 25.3	−13 16.5	−13 07.0
6	−13 23.1	−13 14.1	−13 04.6
12	−13 20.9	−13 11.8	−13 02.1
18	−13 18.7	−13 09.4	−12 59.6
24	−13 16.5	−13 07.0	−12 57.1

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
24	4 31	12 39	6 11	18 46	4 17
25	5 19	12 40	6 09	18 42	4 13
26	6 10	12 40	6 07	18 39	4 09
27	7 03	12 41	6 06	18 35	4 05

Last Quarter 25

G M T		♈	VENUS − 3.4		MARS 0.8		JUPITER − 1.9		SATURN 0.6		MOON			
		GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
27	0	156 17.6	169 52.4	− 7 22.4	268 30.6	−21 08.5	80 31.6	+22 30.7	298 34.7	−12 08.5	257 59.9	86	−25 52.5 −	1
	1	171 20.0	184 51.9	21.2	283 31.7	08.8	95 34.0	30.7	313 37.2	08.5	272 27.5	86	25 52.6	0
	2	186 22.5	199 51.5	20.0	298 32.7	09.0	110 36.3	30.7	328 39.7	08.5	286 55.1	85	25 52.6 +	2
	3	201 24.9	214 51.1	·· 18.8	313 33.8	·· 09.2	125 38.6	·· 30.7	343 42.2	·· 08.4	301 22.6	85	·25 52.4 +	3
	4	216 27.4	229 50.6	17.5	328 34.9	09.4	140 40.9	30.7	358 44.7	08.4	315 50.1	84	25 52.1 +	4
	5	231 29.9	244 50.2	16.3	343 35.9	09.7	155 43.2	30.8	13 47.2	08.4	330 17.5	84	25 51.7 +	6
	6	246 32.3	259 49.8	− 7 15.1	358 37.0	−21 09.9	170 45.6	+22 30.8	28 49.7	−12 08.4	344 44.9	84	−25 51.1 +	7
	7	261 34.8	274 49.3	13.9	13 38.1	10.1	185 47.9	30.8	43 52.2	08.4	359 12.3	83	25 50.4 +	9
	8	276 37.3	289 48.9	12.7	28 39.2	10.4	200 50.2	30.8	58 54.7	08.3	13 39.6	84	25 49.5 +	10
	9	291 39.7	304 48.5	·· 11.4	43 40.2	·· 10.6	215 52.5	·· 30.8	73 57.2	·· 08.3	28 07.0	82	·25 48.5 +	11
	10	306 42.2	319 48.0	10.2	58 41.3	10.8	230 54.8	30.9	88 59.7	08.3	42 34.2	83	25 47.4 +	13
	11	321 44.7	334 47.6	09.0	73 42.4	11.1	245 57.1	30.9	104 02.2	08.3	57 01.5	82	25 46.1 +	15
	12	336 47.1	349 47.2	− 7 07.8	88 43.4	−21 11.3	260 59.4	+22 30.9	119 04.7	−12 08.2	71 28.7	82	−25 44.6 +	16
	13	351 49.6	4 46.7	06.6	103 44.5	11.5	276 01.8	30.9	134 07.2	08.2	85 55.9	81	25 43.0 +	17
	14	6 52.0	19 46.3	05.3	118 45.6	11.7	291 04.1	31.0	149 09.7	08.2	100 23.0	82	25 41.3 +	18
	15	21 54.5	34 45.9	·· 04.1	133 46.7	·· 12.0	306 06.4	·· 31.0	164 12.2	·· 08.2	114 50.2	81	·25 39.5 +	21
	16	36 57.0	49 45.5	02.9	148 47.7	12.2	321 08.7	31.0	179 14.7	08.2	129 17.3	80	25 37.4 +	21
	17	51 59.4	64 45.0	01.7	163 48.8	12.4	336 11.0	31.0	194 17.2	08.1	143 44.3	81	25 35.3 +	23
	18	67 01.9	79 44.6	− 7 00.4	178 49.9	−21 12.6	351 13.3	+22 31.0	209 19.7	−12 08.1	158 11.4	80	−25 33.0 +	25
	19	82 04.4	94 44.2	6 59.2	193 50.9	12.9	6 15.6	31.1	224 22.2	08.1	172 38.4	80	25 30.5 +	25
	20	97 06.8	109 43.7	58.0	208 52.0	13.1	21 17.9	31.1	239 24.7	08.1	187 05.4	80	25 28.0 +	28
	21	112 09.3	124 43.3	·· 56.8	223 53.1	·· 13.3	36 20.3	·· 31.1	254 27.2	·· 08.0	201 32.4	80	·25 25.2 +	29
	22	127 11.8	139 42.9	55.5	238 54.2	13.6	51 22.6	31.1	269 29.7	08.0	215 59.4	80	25 22.3 +	30
	23	142 14.2	154 42.5	54.3	253 55.2	13.8	66 24.9	31.1	284 32.2	08.0	230 26.4	79	25 19.3 +	32
28	0	157 16.7	169 42.0	− 6 53.1	268 56.3	−21 14.0	81 27.2	+22 31.2	299 34.8	−12 08.0	244 53.3	79	−25 16.1 +	33
	1	172 19.2	184 41.6	51.8	283 57.4	14.2	96 29.5	31.2	314 37.3	07.9	259 20.2	79	25 12.8 +	34
	2	187 21.6	199 41.2	50.6	298 58.5	14.5	111 31.8	31.2	329 39.8	07.9	273 47.1	79	25 09.4 +	37
	3	202 24.1	214 40.7	·· 49.4	313 59.5	·· 14.7	126 34.1	·· 31.2	344 42.3	·· 07.9	288 14.0	79	·25 05.7 +	37
	4	217 26.5	229 40.3	48.2	329 00.6	14.9	141 36.4	31.2	359 44.8	07.9	302 40.9	79	25 02.0 +	39
	5	232 29.0	244 39.9	46.9	344 01.7	15.1	156 38.7	31.3	14 47.3	07.8	317 07.8	78	24 58.1 +	41
	6	247 31.5	259 39.5	− 6 45.7	359 02.8	−21 15.4	171 41.0	+22 31.3	29 49.8	−12 07.8	331 34.6	79	−24 54.0 +	42
	7	262 33.9	274 39.0	44.5	14 03.8	15.6	186 43.4	31.3	44 52.3	07.8	346 01.5	78	24 49.8 +	43
	8	277 36.4	289 38.6	43.3	29 04.9	15.8	201 45.7	31.3	59 54.8	07.8	0 28.3	78	24 45.5 +	45
	9	292 38.9	304 38.2	·· 42.0	44 06.0	·· 16.0	216 48.0	·· 31.4	74 57.3	·· 07.8	14 55.1	79	·24 41.0 +	46
	10	307 41.3	319 37.8	40.8	59 07.1	16.3	231 50.3	31.4	89 59.8	07.7	29 22.0	78	24 36.4 +	48
	11	322 43.8	334 37.3	39.6	74 08.1	16.5	246 52.6	31.4	105 02.3	07.7	43 48.8	78	24 31.6 +	49
	12	337 46.3	349 36.9	− 6 38.3	89 09.2	−21 16.7	261 54.9	+22 31.4	120 04.8	−12 07.7	58 15.6	78	−24 26.7 +	51
	13	352 48.7	4 36.5	37.1	104 10.3	16.9	276 57.2	31.4	135 07.3	07.7	72 42.4	79	24 21.6 +	52
	14	7 51.2	19 36.1	35.9	119 11.4	17.2	291 59.5	31.5	150 09.9	07.6	87 09.3	78	24 16.4 +	54
	15	22 53.7	34 35.6	·· 34.6	134 12.4	·· 17.4	307 01.8	·· 31.5	165 12.4	·· 07.6	101 36.1	78	·24 11.0 +	55
	16	37 56.1	49 35.2	33.4	149 13.5	17.6	322 04.1	31.5	180 14.9	07.6	116 02.9	78	24 05.5 +	57
	17	52 58.6	64 34.8	32.2	164 14.6	17.8	337 06.4	31.5	195 17.4	07.6	130 29.7	78	23 59.8 +	58
	18	68 01.0	79 34.4	− 6 30.9	179 15.7	−21 18.0	352 08.7	+22 31.5	210 19.9	−12 07.5	144 56.5	79	−23 54.0 +	59
	19	83 03.5	94 33.9	29.7	194 16.7	18.3	7 11.0	31.6	225 22.4	07.5	159 23.4	78	23 48.1 +	61
	20	98 06.0	109 33.5	28.5	209 17.8	18.5	22 13.3	31.6	240 24.9	07.5	173 50.2	78	23 42.0 +	62
	21	113 08.4	124 33.1	·· 27.2	224 18.9	·· 18.7	37 15.6	·· 31.6	255 27.4	·· 07.5	188 17.0	79	·23 35.8 +	64
	22	128 10.9	139 32.7	26.0	239 20.0	18.9	52 17.9	31.6	270 29.9	07.4	202 43.9	78	23 29.4 +	65
	23	143 13.4	154 32.3	24.8	254 21.1	19.2	67 20.2	31.7	285 32.4	07.4	217 10.7	79	23 22.9 +	67
1	0	158 15.8	169 31.8	− 6 23.5	269 22.1	−21 19.4	82 22.5	+22 31.7	300 34.9	−12 07.4	231 37.6	78	−23 16.2 +	68
	1	173 18.3	184 31.4	22.3	284 23.2	19.6	97 24.8	31.7	315 37.5	07.4	246 04.4	79	23 09.4 +	70
	2	188 20.8	199 31.0	21.1	299 24.3	19.8	112 27.1	31.7	330 40.0	07.3	260 31.3	79	23 02.4 +	71
	3	203 23.2	214 30.6	·· 19.8	314 25.4	·· 20.0	127 29.4	·· 31.7	345 42.5	·· 07.3	274 58.2	79	·22 55.3 +	72
	4	218 25.7	229 30.2	18.6	329 26.4	20.3	142 31.7	31.8	0 45.0	07.3	289 25.1	79	22 48.1 +	74
	5	233 28.2	244 29.7	17.4	344 27.5	20.5	157 34.0	31.8	15 47.5	07.3	303 52.0	79	22 40.7 +	75
	6	248 30.6	259 29.3	− 6 16.1	359 28.6	−21 20.7	172 36.3	+22 31.8	30 50.0	−12 07.2	318 18.9	80	−22 33.2 +	77
	7	263 33.1	274 28.9	14.9	14 29.7	20.9	187 38.6	31.8	45 52.5	07.2	332 45.9	79	22 25.5 +	78
	8	278 35.5	289 28.5	13.7	29 30.8	21.1	202 40.9	31.9	60 55.0	07.2	347 12.8	80	22 17.7 +	79
	9	293 38.0	304 28.1	·· 12.4	44 31.8	·· 21.4	217 43.2	·· 31.9	75 57.5	·· 07.2	1 39.8	80	·22 09.8 +	81
	10	308 40.5	319 27.6	11.2	59 32.9	21.6	232 45.5	31.9	91 00.0	07.1	16 06.8	80	22 01.7 +	82
	11	323 42.9	334 27.2	10.0	74 34.0	21.8	247 47.8	31.9	106 02.6	07.1	30 33.8	80	21 53.5 +	84
	12	338 45.4	349 26.8	− 6 08.7	89 35.1	−21 22.0	262 50.1	+22 31.9	121 05.1	−12 07.1	45 00.8	80	−21 45.1 +	85
	13	353 47.9	4 26.4	07.5	104 36.2	22.2	277 52.4	32.0	136 07.6	07.1	59 27.8	81	21 36.6 +	86
	14	8 50.3	19 26.0	06.2	119 37.2	22.5	292 54.7	32.0	151 10.1	07.0	73 54.9	81	21 28.0 +	88
	15	23 52.8	34 25.6	·· 05.0	134 38.3	·· 22.7	307 57.0	·· 32.0	166 12.6	·· 07.0	88 22.0	81	·21 19.2 +	89
	16	38 55.3	49 25.1	03.8	149 39.4	22.9	322 59.3	32.0	181 15.1	07.0	102 49.1	81	21 10.3 +	90
	17	53 57.7	64 24.7	02.5	164 40.5	23.1	338 01.6	32.1	196 17.6	07.0	117 16.2	81	21 01.3 +	92
	18	69 00.2	79 24.3	− 6 01.3	179 41.6	−21 23.3	353 03.9	+22 32.1	211 20.1	−12 06.9	131 43.3	82	−20 52.1 +	93
	19	84 02.6	94 23.9	6 00.0	194 42.6	23.5	8 06.2	32.1	226 22.7	06.9	146 10.5	82	20 42.8 +	94
	20	99 05.1	109 23.5	5 58.8	209 43.7	23.8	23 08.5	32.1	241 25.2	06.9	160 37.7	82	20 33.4 +	96
	21	114 07.6	124 23.1	·· 57.6	224 44.8	·· 24.0	38 10.8	·· 32.1	256 27.7	·· 06.9	175 04.9	82	·20 23.8 +	97
	22	129 10.0	139 22.6	56.3	239 45.9	24.2	53 13.1	32.2	271 30.2	06.8	189 32.1	83	20 14.1 +	99
	23	144 12.5	154 22.2	55.1	254 47.0	24.4	68 15.4	32.2	286 32.7	06.8	203 59.4	83	20 04.2 +	99
	24	159 15.0	169 21.8	− 5 53.8	269 48.0	−21 24.6	83 17.7	+22 32.2	301 35.2	−12 06.8	218 26.7	83	−19 54.3 +	101
code		—	− 4	+ 12	+ 11	− 2	+ 23	0	+ 25	0				

GMT		SUN GHA	SUN Dec.
	h	° ′	° ′
27	0	176 45.8	− 8 37.5
	1	191 45.9	36.5
	2	206 46.0	35.6
	3	221 46.1 ••	34.6
	4	236 46.2	33.7
	5	251 46.3	32.8
	6	266 46.4	− 8 31.8
	7	281 46.5	30.9
	8	296 46.6	30.0
	9	311 46.8 ••	29.0
	10	326 46.9	28.1
	11	341 47.0	27.1
	12	356 47.1	− 8 26.2
	13	11 47.2	25.3
	14	26 47.3	24.3
	15	41 47.4 ••	23.4
	16	56 47.5	22.4
	17	71 47.6	21.5
	18	86 47.7	− 8 20.6
	19	101 47.9	19.6
	20	116 48.0	18.7
	21	131 48.1 ••	17.7
	22	146 48.2	16.8
	23	161 48.3	15.9
28	0	176 48.4	− 8 14.9
	1	191 48.5	14.0
	2	206 48.6	13.0
	3	221 48.8 ••	12.1
	4	236 48.9	11.2
	5	251 49.0	10.2
	6	266 49.1	− 8 09.3
	7	281 49.2	08.3
	8	296 49.3	07.4
	9	311 49.4 ••	06.4
	10	326 49.5	05.5
	11	341 49.7	04.5
	12	356 49.8	− 8 03.6
	13	11 49.9	02.7
	14	26 50.0	01.7
	15	41 50.1 •	8 00.8
	16	56 50.2	7 59.8
	17	71 50.4	58.9
	18	86 50.5	− 7 57.9
	19	101 50.6	57.0
	20	116 50.7	56.0
	21	131 50.8 ••	55.1
	22	146 50.9	54.2
	23	161 51.1	53.2
1	0	176 51.2	− 7 52.3
	1	191 51.3	51.3
	2	206 51.4	50.4
	3	221 51.5 ••	49.4
	4	236 51.6	48.5
	5	251 51.8	47.5
	6	266 51.9	− 7 46.6
	7	281 52.0	45.6
	8	296 52.1	44.7
	9	311 52.2 ••	43.7
	10	326 52.4	42.8
	11	341 52.5	41.8
	12	356 52.6	− 7 40.9
	13	11 52.7	39.9
	14	26 52.8	39.0
	15	41 53.0 ••	38.0
	16	56 53.1	37.1
	17	71 53.2	36.1
	18	86 53.3	− 7 35.2
	19	101 53.4	34.2
	20	116 53.6	33.3
	21	131 53.7 ••	32.3
	22	146 53.8	31.4
	23	161 53.9	30.4
	24	176 54.1	− 7 29.5
code		—	+ 9

STARS No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 52.1	−40 29.4
5	Achernar	336 00.0	−57 28.3
30	Acrux	173 58.7	−62 50.8
19	Adhara	255 47.2	−28 54.7
10	Aldebaran	291 40.4	+16 25.2
32	Alioth	166 59.0	+56 12.2
34	Alkaid	153 33.4	+49 32.1
55	Al Na'ir	28 39.8	−47 11.0
15	Alnilam	276 31.4	− 1 13.8
25	Alphard	218 39.4	− 8 27.7
41	Alphecca	126 48.5	+26 51.7
1	Alpheratz	358 29.9	+28 50.3
51	Altair	62 51.8	+ 8 44.6
2	Ankaa	353 59.7	−42 33.4
42	Antares	113 20.8	−26 20.0
37	Arcturus	146 36.0	+19 24.9
43	Atria	109 02.7	−68 56.6
22	Avior	234 35.8	−59 21.9
13	Bellatrix	279 19.6	+ 6 18.6
16	Betelg'se	271 49.3	+ 7 24.0
17	Canopus	264 15.7	−52 40.4
12	Capella	281 40.1	+45 57.4
53	Deneb	50 02.2	+45 06.8
28	Denebola	183 18.6	+14 49.4
4	Diphda	349 40.7	−18 14.3
27	Dubhe	194 45.2	+61 59.7
14	Elnath	279 08.7	+28 34.4
47	Eltanin	91 07.0	+51 29.2
54	Enif	34 31.1	+ 9 39.8
56	Fomalhaut	16 13.2	−29 52.0
31	Gacrux	172 50.2	−56 51.5
29	Gienah	176 37.8	−17 17.4
35	Hadar	149 50.8	−60 09.1
6	Hamal	328 51.2	+23 14.9
48	Kaus Aust.	84 42.9	−34 24.5
40	Kochab	137 17.1	+74 20.1
57	Markab	14 23.0	+14 57.5
8	Menkar	315 01.7	+ 3 54.7
36	Menkent	148 59.9	−36 08.8
24	Miapl'dus	221 48.6	−69 31.9
9	Mirfak	309 44.3	+49 42.3
50	Nunki	76 53.5	−26 21.4
52	Peacock	54 29.5	−56 52.9
21	Pollux	244 21.7	+28 08.3
20	Procyon	245 46.0	+ 5 20.5
46	R'alhague	96 47.8	+12 35.3
26	Regulus	208 30.4	+12 11.3
11	Rigel	281 54.7	− 8 15.3
38	Rigil Kent.	140 52.4	−60 38.9
44	Sabik	103 03.6	−15 40.3
3	Schedar	350 31.9	+56 17.4
45	Shaula	97 22.4	−37 04.3
18	Sirius	259 12.7	−16 39.3
33	Spica	159 17.9	−10 55.6
23	Suhail	223 24.8	−43 15.0
49	Vega	81 09.3	+38 44.1
39	Zub'g'bi	137 54.5	−15 51.3

Lat.	Sunrise	Twlt. begins	Moonrise 27	28	1	2
N °	h m	h m	h m	h m	h m	h m
72	7 45	3 58	■	■	■	■
70	7 34	4 11	■	■	■	8 14
68	7 26	4 22	■	■	■	7 31
66	7 19	4 29	■	■	7 24	7 01
64	7 13	4 36	6 48	6 46	6 43	6 39
62	7 07	4 42	5 25	5 59	6 14	6 21
60	7 03	4 47	4 49	5 29	5 52	6 06
58	6 59	4 51	4 22	5 06	5 34	5 53
56	6 55	4 54	4 02	4 47	5 19	5 42
54	6 52	4 56	3 45	4 31	5 06	5 32
52	6 49	4 59	3 30	4 18	4 55	5 24
50	6 47	5 01	3 17	4 06	4 45	5 16
45	6 41	5 04	2 51	3 41	4 23	4 59
40	6 36	5 07	2 30	3 21	4 06	4 45
35	6 32	5 09	2 13	3 04	3 51	4 33
30	6 28	5 09	1 58	2 50	3 39	4 23
20	6 21	5 09	1 33	2 26	3 17	4 05
10	6 15	5 05	1 11	2 05	2 58	3 49
0	6 09	5 00	0 50	1 45	2 40	3 35
10	6 04	4 52	0 30	1 25	2 22	3 20
20	5 57	4 42	0 08	1 04	2 03	3 04
30	5 50	4 27	24 39	0 39	1 41	2 46
35	5 46	4 17	24 25	0 25	1 28	2 35
40	5 41	4 04	24 08	0 08	1 13	2 23
45	5 35	3 48	23 48	24 55	0 55	2 09
50	5 28	3 26	23 23	24 33	0 33	1 51
52	5 25	3 16	23 11	24 22	0 22	1 43
54	5 21	3 03	22 57	24 10	0 10	1 33
56	5 17	2 48	22 41	23 56	25 22	1 22
58	5 13	2 30	22 21	23 40	25 10	1 10
60	5 08	2 07	21 57	23 20	24 56	0 56
S						

Lat.	Sunset	Twlt. ends	Moonset 27	28	1	2
N °	h m	h m	h m	h m	h m	h m
72	16 43	20 35	■	■	■	■
70	16 53	20 21	■	■	■	11 40
68	17 01	20 10	■	■	■	12 22
66	17 08	20 01	■	■	10 34	12 51
64	17 14	19 54	7 19	9 16	11 15	13 12
62	17 19	19 48	8 42	10 02	11 42	13 29
60	17 24	19 43	9 19	10 33	12 04	13 43
58	17 28	19 39	9 45	10 55	12 21	13 55
56	17 31	19 35	10 05	11 14	12 36	14 05
54	17 34	19 32	10 23	11 29	12 48	14 14
52	17 37	19 29	10 37	11 43	12 59	14 22
50	17 40	19 28	10 50	11 54	13 09	14 30
45	17 45	19 23	11 16	12 19	13 29	14 45
40	17 50	19 20	11 37	12 38	13 46	14 58
35	17 54	19 18	11 54	12 54	14 00	15 08
30	17 58	19 18	12 09	13 08	14 12	15 18
20	18 05	19 18	12 34	13 32	14 32	15 34
10	18 10	19 20	12 56	13 52	14 50	15 47
0	18 16	19 25	13 16	14 11	15 06	16 00
10	18 22	19 33	13 37	14 30	15 23	16 13
20	18 28	19 43	13 58	14 50	15 40	16 26
30	18 35	19 57	14 23	15 13	16 00	16 42
35	18 39	20 07	14 38	15 27	16 11	16 51
40	18 44	20 19	14 55	15 43	16 24	17 01
45	18 50	20 35	15 15	16 01	16 40	17 12
50	18 56	20 55	15 41	16 24	16 59	17 27
52	18 59	21 05	15 53	16 35	17 08	17 33
54	19 03	21 18	16 07	16 48	17 18	17 40
56	19 07	21 32	16 24	17 02	17 29	17 48
58	19 11	21 50	16 43	17 19	17 42	17 57
60	19 16	22 13	17 08	17 39	17 57	18 08
S						

GMT	Equation of Time (App.—Mean) 27	28	1
h	m s	m s	m s
0	−12 57.1	−12 46.6	−12 35.5
6	−12 54.5	−12 43.9	−12 32.7
12	−12 51.9	−12 41.1	−12 29.8
18	−12 49.2	−12 38.3	−12 26.9
24	−12 46.6	−12 35.5	−12 24.0

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
27	7 03	12 41	6 06	18 35	4 05
28	7 58	12 42	6 04	18 31	4 01
1	8 53	12 42	6 02	18 28	3 57
2	9 48	12 43	6 00	18 24	3 53

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.5	0.1	0.1
30			
	0.5	0.1	0.1
45			
	0.5	0.1	0.1
60			
	0.5	0.0	0.0
75			
	0.5	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	27	28	1
°	′	′	′
0			
	14.5	15.7	16.8
4			
	14.5	15.7	16.8
8			
	14.5	15.7	16.8
12			
	14.6	15.7	16.8
16			
	14.6	15.7	16.8
20			
	14.6	15.7	16.8
24			
	14.6	15.7	16.7
28			
	14.6	15.7	16.7
32			
	14.7	15.7	16.7
36			
	14.7	15.7	16.6
40			
	14.7	15.7	16.6
44			
	14.8	15.6	16.5
48			
	14.8	15.6	16.5
52			
	14.9	15.6	16.4
56			
	14.9	15.6	16.4
60			
	15.0	15.6	16.3
64			
	15.0	15.6	16.2
68			
	15.1	15.6	16.2
72			
	15.1	15.6	16.1
76			
	15.2	15.6	16.0
80			
	15.2	15.6	16.0
84			
	15.3	15.6	15.9
88			
	15.3	15.6	15.8
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	27	28	1
°	′	′	′
0			
	16.1	15.5	14.8
4			
	16.1	15.5	14.8
8			
	16.1	15.5	14.8
12			
	16.1	15.5	14.9
16			
	16.1	15.5	14.9
20			
	16.1	15.5	14.9
24			
	16.1	15.5	14.9
28			
	16.0	15.5	15.0
32			
	16.0	15.5	15.0
36			
	16.0	15.5	15.0
40			
	15.9	15.5	15.1
44			
	15.9	15.5	15.1
48			
	15.8	15.5	15.2
52			
	15.8	15.5	15.2
56			
	15.8	15.5	15.3
60			
	15.7	15.5	15.4
64			
	15.7	15.5	15.4
68			
	15.6	15.5	15.5
72			
	15.6	15.6	15.5
76			
	15.5	15.6	15.6
80			
	15.4	15.6	15.7
84			
	15.4	15.6	15.8
88			
	15.3	15.6	15.8
90			

Subtract from table, back cover

Quinquagesima (Shrove Sunday) 28

GMT		♈	VENUS −3.4		MARS 0.8		JUPITER −1.9		SATURN 0.6		MOON			
	h	GHA ° ′	GHA ° ′	Dec. ° ′	GHA ° ′	Dec. ° ′	GHA ° ′	Dec. ° ′	GHA ° ′	Dec. ° ′	GHA ° ′	code	Dec. ° ′	code
2	0	159 15.0	169 21.8	−5 53.8	269 48.0	−21 24.6	83 17.7	+22 32.2	301 35.2	−12 06.8	218 26.7	83	−19 54.3	+101
	1	174 17.4	184 21.4	52.6	284 49.1	24.8	98 20.0	32.2	316 37.7	06.7	232 54.0	83	19 44.2	+102
	2	189 19.9	199 21.0	51.4	299 50.2	25.1	113 22.3	32.3	331 40.3	06.7	247 21.3	84	19 34.0	+104
	3	204 22.4	214 20.6	50.1	314 51.3	25.3	128 24.6	32.3	346 42.8	06.7	261 48.7	84	19 23.6	+105
	4	219 24.8	229 20.2	48.9	329 52.4	25.5	143 26.9	32.3	1 45.3	06.7	276 16.1	84	19 13.1	+106
	5	234 27.3	244 19.7	47.6	344 53.5	25.7	158 29.2	32.3	16 47.8	06.6	290 43.5	84	19 02.5	+107
	6	249 29.8	259 19.3	−5 46.4	359 54.5	−21 25.9	173 31.4	+22 32.3	31 50.3	−12 06.6	305 10.9	85	−18 51.8	+108
	7	264 32.2	274 18.9	45.1	14 55.6	26.1	188 33.7	32.4	46 52.8	06.6	319 38.4	85	18 41.0	+110
	8	279 34.7	289 18.5	43.9	29 56.7	26.4	203 36.0	32.4	61 55.3	06.6	334 05.9	85	18 30.0	+111
	9	294 37.1	304 18.1	42.7	44 57.8	26.6	218 38.3	32.4	76 57.9	06.5	348 33.4	85	18 18.9	+112
	10	309 39.6	319 17.7	41.4	59 58.9	26.8	233 40.6	32.4	92 00.4	06.5	3 00.9	86	18 07.7	+113
	11	324 42.1	334 17.3	40.2	75 00.0	27.0	248 42.9	32.5	107 02.9	06.5	17 28.5	86	17 56.4	+115
	12	339 44.5	349 16.9	−5 38.9	90 01.0	−21 27.2	263 45.2	+22 32.5	122 05.4	−12 06.5	31 56.1	86	−17 44.9	+116
	13	354 47.0	4 16.4	37.7	105 02.1	27.4	278 47.5	32.5	137 07.9	06.4	46 23.7	87	17 33.3	+117
	14	9 49.5	19 16.0	36.4	120 03.2	27.6	293 49.8	32.5	152 10.4	06.4	60 51.4	87	17 21.6	+118
	15	24 51.9	34 15.6	35.2	135 04.3	27.9	308 52.1	32.6	167 13.0	06.4	75 19.1	87	17 09.8	+119
	16	39 54.4	49 15.2	34.0	150 05.4	28.1	323 54.3	32.6	182 15.5	06.3	89 46.8	87	16 57.9	+120
	17	54 56.9	64 14.8	32.7	165 06.5	28.3	338 56.6	32.6	197 18.0	06.3	104 14.5	88	16 45.9	+121
	18	69 59.3	79 14.4	−5 31.5	180 07.5	−21 28.5	353 58.9	+22 32.6	212 20.5	−12 06.3	118 42.3	88	−16 33.8	+123
	19	85 01.8	94 14.0	30.2	195 08.6	28.7	9 01.2	32.6	227 23.0	06.3	133 10.1	88	16 21.5	+124
	20	100 04.3	109 13.6	29.0	210 09.7	28.9	24 03.5	32.7	242 25.5	06.2	147 37.9	89	16 09.1	+124
	21	115 06.7	124 13.2	27.7	225 10.8	29.1	39 05.8	32.7	257 28.1	06.2	162 05.8	88	15 56.7	+126
	22	130 09.2	139 12.8	26.5	240 11.9	29.3	54 08.1	32.7	272 30.6	06.2	176 33.6	89	15 44.1	+127
	23	145 11.6	154 12.3	25.2	255 13.0	29.6	69 10.4	32.7	287 33.1	06.2	191 01.5	90	15 31.4	+128
3	0	160 14.1	169 11.9	−5 24.0	270 14.1	−21 29.8	84 12.6	+22 32.8	302 35.6	−12 06.1	205 29.5	89	−15 18.6	+129
	1	175 16.6	184 11.5	22.7	285 15.2	30.0	99 14.9	32.8	317 38.1	06.1	219 57.4	90	15 05.7	+130
	2	190 19.0	199 11.1	21.5	300 16.2	30.2	114 17.2	32.8	332 40.6	06.1	234 25.4	90	14 52.7	+131
	3	205 21.5	214 10.7	20.2	315 17.3	30.4	129 19.5	32.8	347 43.2	06.0	248 53.4	91	14 39.6	+132
	4	220 24.0	229 10.3	19.0	330 18.4	30.6	144 21.8	32.9	2 45.7	06.0	263 21.5	91	14 26.4	+133
	5	235 26.4	244 09.9	17.7	345 19.5	30.8	159 24.1	32.9	17 48.2	06.0	277 49.6	91	14 13.1	+134
	6	250 28.9	259 09.5	−5 16.5	0 20.6	−21 31.0	174 26.3	+22 32.9	32 50.7	−12 06.0	292 17.7	91	−13 59.7	+135
	7	265 31.4	274 09.1	15.2	15 21.7	31.2	189 28.6	32.9	47 53.2	05.9	306 45.8	91	13 46.2	+136
	8	280 33.8	289 08.7	14.0	30 22.8	31.5	204 30.9	32.9	62 55.8	05.9	321 13.9	92	13 32.6	+137
	9	295 36.3	304 08.3	12.7	45 23.9	31.7	219 33.2	33.0	77 58.3	05.9	335 42.1	92	13 18.9	+137
	10	310 38.7	319 07.9	11.5	60 24.9	31.9	234 35.5	33.0	93 00.8	05.9	350 10.3	92	13 05.2	+139
	11	325 41.2	334 07.5	10.2	75 26.0	32.1	249 37.8	33.0	108 03.3	05.8	4 38.5	93	12 51.3	+139
	12	340 43.7	349 07.1	−5 09.0	90 27.1	−21 32.3	264 40.0	+22 33.0	123 05.8	−12 05.8	19 06.8	92	−12 37.4	+141
	13	355 46.1	4 06.6	07.7	105 28.2	32.5	279 42.3	33.1	138 08.4	05.8	33 35.0	93	12 23.3	+141
	14	10 48.6	19 06.2	06.5	120 29.3	32.7	294 44.6	33.1	153 10.9	05.7	48 03.3	94	12 09.2	+142
	15	25 51.1	34 05.8	05.2	135 30.4	32.9	309 46.9	33.1	168 13.4	05.7	62 31.7	93	11 55.0	+143
	16	40 53.5	49 05.4	04.0	150 31.5	33.1	324 49.2	33.1	183 15.9	05.7	77 00.0	94	11 40.7	+144
	17	55 56.0	64 05.0	02.7	165 32.6	33.3	339 51.4	33.2	198 18.4	05.7	91 28.4	94	11 26.3	+145
	18	70 58.5	79 04.6	−5 01.5	180 33.7	−21 33.6	354 53.7	+22 33.2	213 21.0	−12 05.6	105 56.8	94	−11 11.8	+145
	19	86 00.9	94 04.2	5 00.2	195 34.7	33.8	9 56.0	33.2	228 23.5	05.6	120 25.2	94	10 57.3	+146
	20	101 03.4	109 03.8	4 59.0	210 35.8	34.0	24 58.3	33.2	243 26.0	05.6	134 53.6	94	10 42.7	+147
	21	116 05.9	124 03.4	57.7	225 36.9	34.2	40 00.6	33.3	258 28.5	05.5	149 22.0	95	10 28.0	+148
	22	131 08.3	139 03.0	56.5	240 38.0	34.4	55 02.8	33.3	273 31.0	05.5	163 50.5	95	10 13.2	+148
	23	146 10.8	154 02.6	55.2	255 39.1	34.6	70 05.1	33.3	288 33.6	05.5	178 19.0	95	9 58.4	+149
4	0	161 13.2	169 02.2	−4 54.0	270 40.2	−21 34.8	85 07.4	+22 33.3	303 36.1	−12 05.5	192 47.5	95	−9 43.5	+150
	1	176 15.7	184 01.8	52.7	285 41.3	35.0	100 09.7	33.3	318 38.6	05.4	207 16.0	96	9 28.5	+151
	2	191 18.2	199 01.4	51.5	300 42.4	35.2	115 11.9	33.4	333 41.1	05.4	221 44.6	95	9 13.4	+151
	3	206 20.6	214 01.0	50.2	315 43.5	35.4	130 14.2	33.4	348 43.7	05.4	236 13.1	96	8 58.3	+152
	4	221 23.1	229 00.6	49.0	330 44.6	35.6	145 16.5	33.4	3 46.2	05.3	250 41.7	96	8 43.1	+152
	5	236 25.6	244 00.2	47.7	345 45.7	35.8	160 18.8	33.4	18 48.7	05.3	265 10.3	96	8 27.9	+153
	6	251 28.0	258 59.8	−4 46.5	0 46.7	−21 36.0	175 21.1	+22 33.5	33 51.2	−12 05.3	279 38.9	96	−8 12.6	+154
	7	266 30.5	273 59.4	45.2	15 47.8	36.2	190 23.3	33.5	48 53.7	05.3	294 07.5	96	7 57.2	+154
	8	281 33.0	288 59.0	43.9	30 48.9	36.4	205 25.6	33.5	63 56.3	05.2	308 36.1	97	7 41.8	+155
	9	296 35.4	303 58.6	42.7	45 50.0	36.7	220 27.9	33.5	78 58.8	05.2	323 04.8	96	7 26.3	+155
	10	311 37.9	318 58.2	41.4	60 51.1	36.9	235 30.1	33.6	94 01.3	05.2	337 33.4	97	7 10.8	+156
	11	326 40.4	333 57.8	40.2	75 52.2	37.1	250 32.4	33.6	109 03.8	05.1	352 02.1	96	6 55.2	+156
	12	341 42.8	348 57.4	−4 38.9	90 53.3	−21 37.3	265 34.7	+22 33.6	124 06.4	−12 05.1	6 30.7	97	−6 39.6	+157
	13	356 45.3	3 57.0	37.7	105 54.4	37.5	280 37.0	33.6	139 08.9	05.1	20 59.4	97	6 23.9	+158
	14	11 47.7	18 56.6	36.4	120 55.5	37.7	295 39.2	33.7	154 11.4	05.1	35 28.1	97	6 08.1	+158
	15	26 50.2	33 56.2	35.2	135 56.6	37.9	310 41.5	33.7	169 13.9	05.0	49 56.8	97	5 52.3	+158
	16	41 52.7	48 55.8	33.9	150 57.7	38.1	325 43.8	33.7	184 16.5	05.0	64 25.5	97	5 36.5	+159
	17	56 55.1	63 55.4	32.6	165 58.8	38.3	340 46.1	33.7	199 19.0	05.0	78 54.2	98	5 20.6	+159
	18	71 57.6	78 55.0	−4 31.4	180 59.9	−21 38.5	355 48.3	+22 33.8	214 21.5	−12 04.9	93 23.0	97	−5 04.7	+159
	19	87 00.1	93 54.6	30.1	196 01.0	38.7	10 50.6	33.8	229 24.0	04.9	107 51.7	97	4 48.8	+160
	20	102 02.5	108 54.2	28.9	211 02.1	38.9	25 52.9	33.8	244 26.6	04.9	122 20.4	98	4 32.8	+161
	21	117 05.0	123 53.8	27.6	226 03.2	39.1	40 55.1	33.8	259 29.1	04.9	136 49.2	97	4 16.7	+160
	22	132 07.5	138 53.4	26.4	241 04.3	39.3	55 57.4	33.8	274 31.6	04.8	151 17.9	97	4 00.7	+161
	23	147 09.9	153 53.0	25.1	256 05.3	39.5	70 59.7	33.9	289 34.1	04.8	165 46.6	98	3 44.6	+162
	24	162 12.4	168 52.6	−4 23.8	271 06.4	−21 39.7	86 02.0	+22 33.9	304 36.7	−12 04.8	180 15.4	97	−3 28.4	+161
code		—	−5	+13	+11	−2	+23	+1	+26	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
2 0	176 54.1	− 7 29.5
1	191 54.2	28.5
2	206 54.3	27.6
3	221 54.4 ••	26.6
4	236 54.6	25.7
5	251 54.7	24.7
6	266 54.8	− 7 23.8
7	281 54.9	22.8
8	296 55.1	21.9
9	311 55.2 ••	20.9
10	326 55.3	20.0
11	341 55.4	19.0
12	356 55.6	− 7 18.1
13	11 55.7	17.1
14	26 55.8	16.1
15	41 55.9 ••	15.2
16	56 56.1	14.2
17	71 56.2	13.3
18	86 56.3	− 7 12.3
19	101 56.4	11.4
20	116 56.6	10.4
21	131 56.7 ••	09.5
22	146 56.8	08.5
23	161 56.9	07.6
3 0	176 57.1	− 7 06.6
1	191 57.2	05.6
2	206 57.3	04.7
3	221 57.5 ••	03.7
4	236 57.6	02.8
5	251 57.7	01.8
6	266 57.8	− 7 00.9
7	281 58.0	6 59.9
8	296 58.1	58.9
9	311 58.2 ••	58.0
10	326 58.4	57.0
11	341 58.5	56.1
12	356 58.6	− 6 55.1
13	11 58.7	54.2
14	26 58.9	53.2
15	41 59.0 ••	52.2
16	56 59.1	51.3
17	71 59.3	50.3
18	86 59.4	− 6 49.4
19	101 59.5	48.4
20	116 59.7	47.5
21	131 59.8 ••	46.5
22	146 59.9	45.5
23	162 00.1	44.6
4 0	177 00.2	− 6 43.6
1	192 00.3	42.7
2	207 00.5	41.7
3	222 00.6 ••	40.7
4	237 00.7	39.8
5	252 00.9	38.8
6	267 01.0	− 6 37.9
7	282 01.1	36.9
8	297 01.3	35.9
9	312 01.4 ••	35.0
10	327 01.5	34.0
11	342 01.7	33.0
12	357 01.8	− 6 32.1
13	12 01.9	31.1
14	27 02.1	30.2
15	42 02.2 ••	29.2
16	57 02.3	28.2
17	72 02.5	27.3
18	87 02.6	− 6 26.3
19	102 02.8	25.3
20	117 02.9	24.4
21	132 03.0 ••	23.4
22	147 03.2	22.5
23	162 03.3	21.5
24	177 03.4	− 6 20.5
code	−	+ 9

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 52.1	−40 29.4
5	Achernar	336 00.0	−57 28.3
30	Acrux	173 58.7	−62 50.8
19	Adhara	255 47.3	−28 54.7
10	Aldebaran	291 40.4	+16 25.2
32	Alioth	166 58.9	+56 12.2
34	Alkaid	153 33.4	+49 32.1
55	Al Na'ir	28 39.8	−47 11.0
15	Alnilam	276 31.4	− 1 13.8
25	Alphard	218 39.4	− 8 27.7
41	Alphecca	126 48.5	+26 51.7
1	Alpheratz	358 29.9	+28 50.3
51	Altair	62 51.8	+ 8 44.6
2	Ankaa	353 59.7	−42 33.3
42	Antares	113 20.8	−26 20.0
37	Arcturus	146 36.0	+19 24.9
43	Atria	109 02.6	−68 56.6
22	Avior	234 35.8	−59 21.9
13	Bellatrix	279 19.6	+ 6 18.6
16	Betelg'se	271 49.3	+ 7 24.0
17	Canopus	264 15.7	−52 40.4
12	Capella	281 40.1	+45 57.4
53	Deneb	50 02.2	+45 06.8
28	Denebola	183 18.6	+14 49.4
4	Diphda	349 40.7	−18 14.3
27	Dubhe	194 45.2	+61 59.8
14	Elnath	279 08.8	+28 34.4
47	Eltanin	91 06.9	+51 29.2
54	Enif	34 31.1	+ 9 39.8
56	Fomalhaut	16 13.2	−29 52.0
31	Gacrux	172 50.2	−56 51.5
29	Gienah	176 37.8	−17 17.5
35	Hadar	149 50.8	−60 09.2
6	Hamal	328 51.2	+23 14.9
48	Kaus Aust.	84 42.9	−34 24.5
40	Kochab	137 17.1	+74 20.1
57	Markab	14 23.0	+14 57.5
8	Menkar	315 01.7	+ 3 54.7
36	Menkent	148 59.8	−36 08.8
24	Miapl'dus	221 48.6	−69 31.9
9	Mirfak	309 44.3	+49 42.3
50	Nunki	76 53.5	−26 21.4
52	Peacock	54 29.5	−56 52.9
21	Pollux	244 21.7	+28 08.3
20	Procyon	245 46.0	+ 5 20.5
46	R'alhague	96 47.8	+12 35.2
26	Regulus	208 30.4	+12 11.3
11	Rigel	281 54.7	− 8 15.3
38	Rigil Kent.	140 52.3	−60 38.9
44	Sabik	103 03.5	−15 40.3
3	Schedar	350 31.9	+56 17.4
45	Shaula	97 22.3	−37 04.3
18	Sirius	259 12.7	−16 39.3
33	Spica	159 17.9	−10 55.6
23	Suhail	223 24.9	−43 15.0
49	Vega	81 09.2	+38 44.1
39	Zub'g'bi	137 54.5	−15 51.3

Lat.	Sunrise	Twlt. begins	Moonrise 2	Moonrise 3	Moonrise 4	Moonrise 5
N °	h m	h m	h m	h m	h m	h m
72	7 29	3 40	■	7 50	7 08	6 36
70	7 20	3 56	8 14	7 24	6 56	6 33
68	7 13	4 08	7 31	7 04	6 47	6 31
66	7 07	4 18	7 01	6 49	6 39	6 30
64	7 02	4 26	6 39	6 35	6 32	6 28
62	6 58	4 32	6 21	6 24	6 26	6 27
60	6 54	4 38	6 06	6 15	6 21	6 26
58	6 51	4 43	5 53	6 06	6 16	6 25
56	6 48	4 46	5 42	5 59	6 12	6 24
54	6 45	4 49	5 32	5 52	6 09	6 23
52	6 43	4 53	5 24	5 46	6 05	6 22
50	6 40	4 54	5 16	5 41	6 02	6 22
45	6 35	4 59	4 59	5 29	5 56	6 20
40	6 31	5 03	4 45	5 19	5 50	6 19
35	6 28	5 05	4 33	5 11	5 45	6 18
30	6 24	5 06	4 23	5 03	5 41	6 17
20	6 19	5 07	4 05	4 50	5 33	6 15
10	6 14	5 04	3 49	4 39	5 27	6 14
0	6 09	5 00	3 35	4 28	5 21	6 13
10	6 04	4 53	3 20	4 18	5 15	6 11
20	5 58	4 43	3 04	4 06	5 08	6 10
30	5 52	4 29	2 46	3 53	5 00	6 08
35	5 48	4 20	2 35	3 45	4 56	6 07
40	5 44	4 09	2 23	3 36	4 51	6 06
45	5 39	3 54	2 09	3 26	4 45	6 05
50	5 33	3 34	1 51	3 14	4 38	6 04
52	5 30	3 25	1 43	3 08	4 35	6 03
54	5 27	3 12	1 33	3 01	4 32	6 03
56	5 24	2 59	1 22	2 54	4 28	6 02
58	5 20	2 43	1 10	2 46	4 23	6 01
60	5 16	2 23	0 56	2 37	4 18	6 00
S						

Lat.	Sunset	Twlt. ends	Moonset 2	Moonset 3	Moonset 4	Moonset 5
N °	h m	h m	h m	h m	h m	h m
72	16 57	20 52	■	13 59	16 33	18 57
70	17 06	20 35	11 40	14 22	16 41	18 55
68	17 13	20 23	12 22	14 40	16 48	18 53
66	17 18	20 11	12 51	14 55	16 54	18 52
64	17 23	20 03	13 12	15 06	16 58	18 50
62	17 28	19 57	13 29	15 16	17 03	18 49
60	17 31	19 50	13 43	15 25	17 06	18 48
58	17 35	19 46	13 55	15 32	17 09	18 47
56	17 37	19 41	14 05	15 38	17 12	18 47
54	17 40	19 38	14 14	15 44	17 14	18 46
52	17 42	19 34	14 22	15 49	17 17	18 45
50	17 45	19 33	14 30	15 54	17 19	18 45
45	17 49	19 27	14 45	16 04	17 23	18 44
40	17 54	19 24	14 58	16 12	17 27	18 43
35	17 57	19 21	15 08	16 19	17 30	18 42
30	18 00	19 20	15 18	16 25	17 33	18 41
20	18 06	19 19	15 34	16 36	17 37	18 40
10	18 11	19 21	15 47	16 45	17 41	18 38
0	18 15	19 24	16 00	16 53	17 45	18 37
10	18 20	19 31	16 13	17 02	17 49	18 36
20	18 25	19 39	16 26	17 11	17 53	18 35
30	18 32	19 54	16 42	17 21	17 57	18 33
35	18 35	20 02	16 51	17 27	18 00	18 33
40	18 39	20 13	17 01	17 33	18 03	18 32
45	18 44	20 28	17 12	17 41	18 06	18 30
50	18 50	20 47	17 27	17 50	18 10	18 29
52	18 52	20 56	17 33	17 54	18 12	18 28
54	18 55	21 07	17 40	17 58	18 13	18 28
56	18 59	21 20	17 48	18 03	18 16	18 27
58	19 02	21 35	17 57	18 09	18 18	18 26
60	19 06	21 55	18 08	18 15	18 21	18 25
S						

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.5	0.1	0.1
30			
	0.5	0.1	0.1
45			
	0.5	0.1	0.1
60			
	0.5	0.0	0.0
75			
	0.5	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	2	3	4
°	′	′	′
0			
	18.0	19.1	19.9
4			
	18.0	19.1	19.9
8			
	17.9	19.1	19.8
12			
	17.9	19.0	19.8
16			
	17.9	19.0	19.7
20			
	17.8	18.9	19.6
24			
	17.8	18.8	19.5
28			
	17.7	18.7	19.4
32			
	17.6	18.6	19.3
36			
	17.6	18.5	19.2
40			
	17.5	18.4	19.0
44			
	17.4	18.3	18.8
48			
	17.3	18.1	18.7
52			
	17.2	18.0	18.5
56			
	17.1	17.8	18.3
60			
	17.0	17.6	18.1
64			
	16.8	17.5	17.9
68			
	16.7	17.3	17.6
72			
	16.6	17.1	17.4
76			
	16.5	16.9	17.2
80			
	16.3	16.7	17.0
84			
	16.2	16.5	16.7
88			
	16.1	16.4	16.5
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	2	3	4
°	′	′	′
0			
	14.2	13.5	13.1
4			
	14.2	13.5	13.1
8			
	14.2	13.6	13.1
12			
	14.2	13.6	13.2
16			
	14.3	13.6	13.2
20			
	14.3	13.7	13.3
24			
	14.4	13.8	13.4
28			
	14.4	13.9	13.5
32			
	14.5	14.0	13.7
36			
	14.6	14.1	13.8
40			
	14.7	14.2	13.9
44			
	14.7	14.4	14.1
48			
	14.8	14.5	14.3
52			
	15.0	14.7	14.5
56			
	15.1	14.8	14.7
60			
	15.2	15.0	14.9
64			
	15.3	15.2	15.1
68			
	15.4	15.4	15.3
72			
	15.5	15.5	15.5
76			
	15.7	15.7	15.8
80			
	15.8	15.9	16.0
84			
	15.9	16.1	16.2
88			
	16.0	16.3	16.4
90			

Subtract from table, back cover

GMT	Equation of Time (App.—Mean) 2	3	4
h	m s	m s	m s
0	−12 24.0	−12 12.0	−11 59.5
6	−12 21.0	−12 08.9	−11 56.3
12	−12 18.1	−12 05.8	−11 53.1
18	−12 15.0	−12 02.6	−11 49.8
24	−12 12.0	−11 59.5	−11 46.5

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
2	9 48	12 43	6 00	18 24	3 53
3	10 41	12 44	5 59	18 20	3 49
4	11 33	12 44	5 57	18 17	3 45
5	12 25	12 45	5 55	18 13	3 41

Ash Wednesday 3

GMT	♈ GHA	VENUS −3.4 GHA	VENUS Dec.	MARS 0.7 GHA	MARS Dec.	JUPITER −1.9 GHA	JUPITER Dec.	SATURN 0.6 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
5 0	162 12.4	168 52.6	− 4 23.8	271 06.4	−21 39.7	86 02.0	+22 33.9	304 36.7	−12 04.8	180 15.4	97	− 3 28.4	+161
1	177 14.8	183 52.2	22.6	286 07.5	39.9	101 04.2	33.9	319 39.2	04.7	194 44.1	97	3 12.3	+162
2	192 17.3	198 51.8	21.3	301 08.6	40.1	116 06.5	33.9	334 41.7	04.7	209 12.8	98	2 56.1	+162
3	207 19.8	213 51.4	·· 20.1	316 09.7	·· 40.3	131 08.8	·· 34.0	349 44.2	·· 04.7	223 41.6	97	· 2 39.9	+162
4	222 22.2	228 51.0	18.8	331 10.8	40.5	146 11.0	34.0	4 46.8	04.6	238 10.3	97	2 23.7	+163
5	237 24.7	243 50.6	17.6	346 11.9	40.7	161 13.3	34.0	19 49.3	04.6	252 39.0	97	2 07.4	+163
6	252 27.2	258 50.2	− 4 16.3	1 13.0	−21 40.9	176 15.6	+22 34.0	34 51.8	−12 04.6	267 07.7	98	− 1 51.1	+163
7	267 29.6	273 49.8	15.0	16 14.1	41.1	191 17.8	34.1	49 54.3	04.6	281 36.5	97	1 34.8	+163
8	282 32.1	288 49.4	13.8	31 15.2	41.3	206 20.1	34.1	64 56.9	04.5	296 05.2	97	1 18.5	+163
9	297 34.6	303 49.0	·· 12.5	46 16.3	·· 41.5	221 22.4	·· 34.1	79 59.4	·· 04.5	310 33.9	97	· 1 02.2	+163
10	312 37.0	318 48.6	11.3	61 17.4	41.7	236 24.6	34.1	95 01.9	04.5	325 02.6	96	0 45.9	+164
11	327 39.5	333 48.2	10.0	76 18.5	41.9	251 26.9	34.2	110 04.5	04.4	339 31.2	97	0 29.5	+163
12	342 42.0	348 47.8	− 4 08.7	91 19.6	−21 42.1	266 29.2	+22 34.2	125 07.0	−12 04.4	353 59.9	97	− 0 13.2	+164
13	357 44.4	3 47.4	07.5	106 20.7	42.3	281 31.4	34.2	140 09.5	04.4	8 28.6	96	+ 0 03.2	+164
14	12 46.9	18 47.0	06.2	121 21.8	42.5	296 33.7	34.2	155 12.0	04.3	22 57.2	97	0 19.6	+163
15	27 49.3	33 46.6	·· 04.9	136 22.9	·· 42.7	311 35.9	·· 34.3	170 14.6	·· 04.3	37 25.9	96	· 0 35.9	+164
16	42 51.8	48 46.2	03.7	151 24.0	42.9	326 38.2	34.3	185 17.1	04.3	51 54.5	96	0 52.3	+164
17	57 54.3	63 45.8	02.4	166 25.1	43.1	341 40.5	34.3	200 19.6	04.2	66 23.1	96	1 08.7	+163
18	72 56.7	78 45.5	− 4 01.2	181 26.2	−21 43.3	356 42.7	+22 34.3	215 22.2	−12 04.2	80 51.7	96	+ 1 25.0	+164
19	87 59.2	93 45.1	3 59.9	196 27.3	43.5	11 45.0	34.4	230 24.7	04.2	95 20.3	95	1 41.4	+164
20	103 01.7	108 44.7	58.6	211 28.4	43.7	26 47.3	34.4	245 27.2	04.2	109 48.8	96	1 57.8	+163
21	118 04.1	123 44.3	·· 57.4	226 29.5	·· 43.9	41 49.5	·· 34.4	260 29.7	·· 04.1	124 17.4	95	· 2 14.1	+163
22	133 06.6	138 43.9	56.1	241 30.6	44.1	56 51.8	34.4	275 32.3	04.1	138 45.9	95	2 30.4	+164
23	148 09.1	153 43.5	54.9	256 31.7	44.3	71 54.1	34.5	290 34.8	04.1	153 14.4	95	2 46.8	+163
6 0	163 11.5	168 43.1	− 3 53.6	271 32.8	−21 44.5	86 56.3	+22 34.5	305 37.3	−12 04.0	167 42.9	94	+ 3 03.1	+163
1	178 14.0	183 42.7	52.3	286 33.9	44.7	101 58.6	34.5	320 39.9	04.0	182 11.3	95	3 19.4	+162
2	193 16.4	198 42.3	51.1	301 35.0	44.9	117 00.8	34.5	335 42.4	04.0	196 39.8	94	3 35.6	+163
3	208 18.9	213 41.9	·· 49.8	316 36.1	·· 45.1	132 03.1	·· 34.6	350 44.9	·· 03.9	211 08.2	94	· 3 51.9	+162
4	223 21.4	228 41.5	48.5	331 37.2	45.3	147 05.4	34.6	5 47.5	03.9	225 36.6	93	4 08.1	+163
5	238 23.8	243 41.1	47.3	346 38.3	45.5	162 07.6	34.6	20 50.0	03.9	240 04.9	94	4 24.4	+161
6	253 26.3	258 40.7	− 3 46.0	1 39.4	−21 45.7	177 09.9	+22 34.6	35 52.5	−12 03.8	254 33.3	93	+ 4 40.5	+162
7	268 28.8	273 40.3	44.7	16 40.5	45.9	192 12.1	34.7	50 55.0	03.8	269 01.6	93	4 56.7	+161
8	283 31.2	288 40.0	43.5	31 41.6	46.1	207 14.4	34.7	65 57.6	03.8	283 29.9	92	5 12.8	+161
9	298 33.7	303 39.6	·· 42.2	46 42.7	·· 46.3	222 16.6	·· 34.7	81 00.1	·· 03.8	297 58.1	93	· 5 28.9	+161
10	313 36.2	318 39.2	41.0	61 43.8	46.5	237 18.9	34.7	96 02.6	03.7	312 26.4	[illegible]	5 45.0	+160
11	328 38.6	333 38.8	39.7	76 44.9	46.7	252 21.2	34.8	111 05.2	03.7	326 54.5	92	6 01.0	+160
12	343 41.1	348 38.4	− 3 38.4	91 46.0	−21 46.9	267 23.4	+22 34.8	126 07.7	−12 03.7	341 22.7	91	+ 6 17.0	+160
13	358 43.6	3 38.0	37.2	106 47.1	47.1	282 25.7	34.8	141 10.2	03.6	355 50.8	91	6 33.0	+159
14	13 46.0	18 37.6	35.9	121 48.2	47.3	297 27.9	34.8	156 12.8	03.6	10 18.9	91	6 48.9	+158
15	28 48.5	33 37.2	·· 34.6	136 49.3	·· 47.5	312 30.2	·· 34.9	171 15.3	·· 03.6	24 47.0	90	· 7 04.7	+159
16	43 50.9	48 36.8	33.4	151 50.5	47.7	327 32.4	34.9	186 17.8	03.5	39 15.0	90	7 20.6	+157
17	58 53.4	63 36.4	32.1	166 51.6	47.9	342 34.7	34.9	201 20.4	03.5	53 43.0	90	7 36.3	+158
18	73 55.9	78 36.0	− 3 30.8	181 52.7	−21 48.0	357 37.0	+22 34.9	216 22.9	−12 03.5	68 11.0	89	+ 7 52.1	+157
19	88 58.3	93 35.7	29.6	196 53.8	48.2	12 39.2	35.0	231 25.4	03.4	82 38.9	89	8 07.8	+156
20	104 00.8	108 35.3	28.3	211 54.9	48.4	27 41.5	35.0	246 28.0	03.4	97 06.8	88	8 23.4	+156
21	119 03.3	123 34.9	·· 27.0	226 56.0	·· 48.6	42 43.7	·· 35.0	261 30.5	·· 03.4	111 34.6	88	· 8 39.0	+155
22	134 05.7	138 34.5	25.8	241 57.1	48.8	57 46.0	35.0	276 33.0	03.3	126 02.4	88	8 54.5	+154
23	149 08.2	153 34.1	24.5	256 58.2	49.0	72 48.2	35.1	291 35.6	03.3	140 30.2	87	9 09.9	+154
7 0	164 10.7	168 33.7	− 3 23.2	271 59.3	−21 49.2	87 50.5	+22 35.1	306 38.1	−12 03.3	154 57.9	87	+ 9 25.3	+154
1	179 13.1	183 33.3	22.0	287 00.4	49.4	102 52.7	35.1	321 40.6	03.2	169 25.6	86	9 40.7	+152
2	194 15.6	198 32.9	20.7	302 01.5	49.6	117 55.0	35.1	336 43.2	03.2	183 53.2	86	9 55.9	+153
3	209 18.0	213 32.5	·· 19.4	317 02.6	·· 49.8	132 57.2	·· 35.2	351 45.7	·· 03.2	198 20.8	86	·10 11.2	+151
4	224 20.5	228 32.2	18.2	332 03.7	50.0	147 59.5	35.2	6 48.2	03.1	212 48.4	85	10 26.3	+151
5	239 23.0	243 31.8	16.9	347 04.8	50.2	163 01.7	35.2	21 50.8	03.1	227 15.9	84	10 41.4	+150
6	254 25.4	258 31.4	− 3 15.6	2 05.9	−21 50.4	178 04.0	+22 35.2	36 53.3	−12 03.1	241 43.3	84	+10 56.4	+149
7	269 27.9	273 31.0	14.4	17 07.0	50.6	193 06.2	35.3	51 55.8	03.1	256 10.7	84	11 11.3	+149
8	284 30.4	288 30.6	13.1	32 08.2	50.7	208 08.5	35.3	66 58.4	03.0	270 38.1	83	11 26.2	+147
9	299 32.8	303 30.2	·· 11.8	47 09.3	·· 50.9	223 10.7	·· 35.3	82 00.9	·· 03.0	285 05.4	83	·11 40.9	+147
10	314 35.3	318 29.8	10.6	62 10.4	51.1	238 13.0	35.3	97 03.4	03.0	299 32.7	83	11 55.6	+147
11	329 37.8	333 29.4	09.3	77 11.5	51.3	253 15.2	35.4	112 06.0	02.9	314 00.0	81	12 10.3	+145
12	344 40.2	348 29.1	− 3 08.0	92 12.6	−21 51.5	268 17.5	+22 35.4	127 08.5	−12 02.9	328 27.1	82	+12 24.8	+144
13	359 42.7	3 28.7	06.7	107 13.7	51.7	283 19.7	35.4	142 11.0	02.9	342 54.3	81	12 39.2	+144
14	14 45.2	18 28.3	05.5	122 14.8	51.9	298 22.0	35.5	157 13.6	02.8	357 21.4	80	12 53.6	+143
15	29 47.6	33 27.9	·· 04.2	137 15.9	·· 52.1	313 24.2	·· 35.5	172 16.1	·· 02.8	11 48.4	80	·13 07.9	+142
16	44 50.1	48 27.5	02.9	152 17.0	52.3	328 26.5	35.5	187 18.7	02.8	26 15.4	79	13 22.1	+141
17	59 52.5	63 27.1	01.7	167 18.1	52.5	343 28.7	35.5	202 21.2	02.7	40 42.3	79	13 36.2	+140
18	74 55.0	78 26.7	− 3 00.4	182 19.2	−21 52.7	358 31.0	+22 35.6	217 23.7	−12 02.7	55 09.2	79	+13 50.2	+139
19	89 57.5	93 26.4	2 59.1	197 20.4	52.8	13 33.2	35.6	232 26.3	02.7	69 36.1	77	14 04.1	+138
20	104 59.9	108 26.0	57.9	212 21.5	53.0	28 35.5	35.6	247 28.8	02.6	84 02.8	78	14 17.9	+138
21	120 02.4	123 25.6	·· 56.6	227 22.6	·· 53.2	43 37.7	·· 35.6	262 31.3	·· 02.6	98 29.6	77	·14 31.7	+136
22	135 04.9	138 25.2	55.3	242 23.7	53.4	58 40.0	35.7	277 33.9	02.6	112 56.3	76	14 45.3	+135
23	150 07.3	153 24.8	54.0	257 24.8	53.6	73 42.2	35.7	292 36.4	02.5	127 22.9	76	14 58.8	+134
24	165 09.8	168 24.4	− 2 52.8	272 25.9	−21 53.8	88 44.5	+22 35.7	307 39.0	−12 02.5	141 49.5	75	+15 12.2	+133
code	–	− 4	+ 12	+ 11	− 2	+ 23	0	+ 25	+ 1				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
5 0	177 03.4	− 6 20.5
1	192 03.6	19.6
2	207 03.7	18.6
3	222 03.9	·· 17.6
4	237 04.0	16.7
5	252 04.1	15.7
6	267 04.3	− 6 14.8
7	282 04.4	13.8
8	297 04.5	12.8
9	312 04.7	·· 11.9
10	327 04.8	10.9
11	342 05.0	09.9
12	357 05.1	− 6 09.0
13	12 05.2	08.0
14	27 05.4	07.0
15	42 05.5	·· 06.1
16	57 05.7	05.1
17	72 05.8	04.1
18	87 05.9	− 6 03.2
19	102 06.1	02.2
20	117 06.2	01.2
21	132 06.4	· 6 00.3
22	147 06.5	5 59.3
23	162 06.7	58.3
6 0	177 06.8	− 5 57.4
1	192 06.9	56.4
2	207 07.1	55.4
3	222 07.2	·· 54.5
4	237 07.4	53.5
5	252 07.5	52.5
6	267 07.6	− 5 51.6
7	282 07.8	50.6
8	297 07.9	49.6
9	312 08.1	·· 48.7
10	327 08.2	47.7
11	342 08.4	46.7
12	357 08.5	− 5 45.8
13	12 08.7	44.8
14	27 08.8	43.8
15	42 08.9	·· 42.8
16	57 09.1	41.9
17	72 09.2	40.9
18	87 09.4	− 5 39.9
19	102 09.5	39.0
20	117 09.7	38.0
21	132 09.8	·· 37.0
22	147 10.0	36.1
23	162 10.1	35.1
7 0	177 10.3	− 5 34.1
1	192 10.4	33.1
2	207 10.6	32.2
3	222 10.7	·· 31.2
4	237 10.8	30.2
5	252 11.0	29.3
6	267 11.1	− 5 28.3
7	282 11.3	27.3
8	297 11.4	26.4
9	312 11.6	·· 25.4
10	327 11.7	24.4
11	342 11.9	23.4
12	357 12.0	− 5 22.5
13	12 12.2	21.5
14	27 12.3	20.5
15	42 12.5	·· 19.5
16	57 12.6	18.6
17	72 12.8	17.6
18	87 12.9	− 5 16.6
19	102 13.1	15.7
20	117 13.2	14.7
21	132 13.4	·· 13.7
22	147 13.5	12.7
23	162 13.7	11.8
24	177 13.8	− 5 10.8
code	—	+ 10

STARS No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 52.1	−40 29.4
5	Achernar	336 00.0	−57 28.3
30	Acrux	173 58.6	−62 50.8
19	Adhara	255 47.3	−28 54.7
10	Aldebaran	291 40.4	+16 25.2
32	Alioth	166 58.9	+56 12.2
34	Alkaid	153 33.3	+49 32.1
55	Al Na'ir	28 39.8	−47 11.0
15	Alnilam	276 31.4	− 1 13.8
25	Alphard	218 39.4	− 8 27.7
41	Alphecca	126 48.5	+26 51.7
1	Alpheratz	358 29.9	+28 50.3
51	Altair	62 51.8	+ 8 44.6
2	Ankaa	353 59.7	−42 33.3
42	Antares	113 20.8	−26 20.0
37	Arcturus	146 36.0	+19 24.9
43	Atria	109 02.6	−68 56.6
22	Avior	234 35.9	−59 21.9
13	Bellatrix	279 19.6	+ 6 18.6
16	Betelg'se	271 49.3	+ 7 24.0
17	Canopus	264 15.7	−52 40.4
12	Capella	281 40.1	+45 57.4
53	Deneb	50 02.2	+45 06.8
28	Denebola	183 18.6	+14 49.4
4	Diphda	349 40.7	−18 14.3
27	Dubhe	194 45.2	+61 59.8
14	Elnath	279 08.8	+28 34.4
47	Eltanin	91 06.9	+51 29.2
54	Enif	34 31.0	+ 9 39.8
56	Fomalhaut	16 13.2	−29 52.0
31	Gacrux	172 50.1	−56 51.5
29	Gienah	176 37.8	−17 17.5
35	Hadar	149 50.8	−60 09.2
6	Hamal	328 51.2	+23 14.9
48	Kaus Aust.	84 42.8	−34 24.5
40	Kochab	137 17.0	+74 20.2
57	Markab	14 23.0	+14 57.5
8	Menkar	315 01.7	+ 3 54.7
36	Menkent	148 59.8	−36 08.8
24	Miapl'dus	221 48.7	−69 31.9
9	Mirfak	309 44.3	+49 42.2
50	Nunki	76 53.5	−26 21.4
52	Peacock	54 29.5	−56 52.9
21	Pollux	244 21.7	+28 08.3
20	Procyon	245 46.0	+ 5 20.5
46	R'alhague	96 47.7	+12 35.2
26	Regulus	208 30.4	+12 11.3
11	Rigel	281 54.7	− 8 15.3
38	Rigil Kent.	140 52.3	−60 38.9
44	Sabik	103 03.5	−15 40.3
3	Schedar	350 31.9	+56 17.3
45	Shaula	97 22.3	−37 04.3
18	Sirius	259 12.7	−16 39.3
33	Spica	159 17.9	−10 55.6
23	Suhail	223 24.9	−43 15.0
49	Vega	81 09.2	+38 44.1
39	Zub'g'bl	137 54.5	−15 51.3

Lat.	Sunrise	Twlt. begins	Moonrise 5	Moonrise 6	Moonrise 7	Moonrise 8
°	h m	h m	h m	h m	h m	h m
N 72	7 13	3 21	6 36	6 06	5 31	4 34
70	7 06	3 40	6 33	6 12	5 47	5 13
68	7 01	3 55	6 31	6 17	6 01	5 41
66	6 56	4 06	6 30	6 21	6 12	6 02
64	6 52	4 14	6 28	6 25	6 21	6 18
62	6 48	4 23	6 27	6 28	6 29	6 33
60	6 45	4 28	6 26	6 31	6 37	6 44
58	6 43	4 34	6 25	6 33	6 43	6 55
56	6 40	4 39	6 24	6 36	6 48	7 04
54	6 38	4 42	6 23	6 38	6 53	7 12
52	6 36	4 45	6 22	6 39	6 58	7 20
50	6 34	4 48	6 22	6 41	7 02	7 26
45	6 30	4 54	6 20	6 45	7 11	7 40
40	6 27	4 58	6 19	6 48	7 18	7 52
35	6 24	5 01	6 18	6 51	7 25	8 02
30	6 21	5 03	6 17	6 53	7 31	8 11
20	6 16	5 04	6 15	6 57	7 41	8 27
10	6 12	5 03	6 14	7 01	7 50	8 41
0	6 08	4 59	6 13	7 05	7 58	8 53
10	6 04	4 54	6 11	7 08	8 07	9 06
20	5 59	4 45	6 10	7 12	8 16	9 20
30	5 54	4 32	6 08	7 17	8 26	9 36
35	5 51	4 23	6 07	7 20	8 32	9 46
40	5 47	4 12	6 06	7 23	8 40	9 57
45	5 43	3 59	6 05	7 26	8 48	10 10
50	5 38	3 40	6 04	7 30	8 58	10 25
52	5 36	3 32	6 03	7 32	9 02	10 33
54	5 33	3 21	6 03	7 35	9 07	10 41
56	5 30	3 09	6 02	7 37	9 13	10 50
58	5 27	2 55	6 01	7 40	9 20	11 01
60 S	5 24	2 36	6 00	7 43	9 27	11 13

Lat.	Sunset	Twlt. ends	Moonset 5	Moonset 6	Moonset 7	Moonset 8
°	h m	h m	h m	h m	h m	h m
N 72	17 12	21 10	18 57	21 25	24 18	0 18
70	17 18	20 50	18 55	21 11	23 41	▭
68	17 24	20 35	18 53	21 00	23 15	25 53
66	17 29	20 23	18 52	20 51	22 56	25 09
64	17 32	20 13	18 50	20 44	22 40	24 41
62	17 36	20 06	18 49	20 37	22 27	24 19
60	17 39	19 59	18 48	20 32	22 16	24 02
58	17 41	19 53	18 47	20 27	22 07	23 47
56	17 44	19 48	18 47	20 22	21 59	23 35
54	17 46	19 44	18 46	20 18	21 52	23 24
52	17 48	19 41	18 45	20 15	21 45	23 14
50	17 50	19 38	18 45	20 12	21 39	23 06
45	17 53	19 31	18 44	20 05	21 27	22 48
40	17 57	19 27	18 43	19 59	21 16	22 33
35	18 00	19 24	18 42	19 54	21 07	22 21
30	18 02	19 21	18 41	19 50	21 00	22 10
20	18 07	19 20	18 40	19 42	20 46	21 51
10	18 11	19 21	18 38	19 36	20 35	21 35
0	18 15	19 24	18 37	19 30	20 24	21 20
10	18 19	19 29	18 36	19 24	20 13	21 06
20	18 23	19 37	18 35	19 17	20 02	20 50
30	18 28	19 49	18 33	19 10	19 49	20 32
35	18 31	19 57	18 33	19 06	19 41	20 21
40	18 35	20 08	18 32	19 01	19 33	20 09
45	18 39	20 22	18 30	18 56	19 23	19 55
50	18 44	20 39	18 29	18 49	19 11	19 38
52	18 46	20 48	18 28	18 46	19 06	19 30
54	18 48	20 57	18 28	18 43	19 00	19 21
56	18 51	21 09	18 27	18 39	18 53	19 11
58	18 54	21 23	18 26	18 35	18 45	19 00
60 S	18 58	21 41	18 25	18 31	18 37	18 47

GMT	Equation of Time (App.—Mean) 5	6	7
h	m s	m s	m s
0	−11 46.5	−11 33.1	−11 19.3
6	−11 43.2	−11 29.7	−11 15.7
12	−11 39.9	−11 26.2	−11 12.2
18	−11 36.5	−11 22.8	−11 08.6
24	−11 33.1	−11 19.3	−11 05.0

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
5	12 25	12 45	5 55	18 13	3 41
6	13 17	12 46	5 53	18 10	3 37
7	14 11	12 46	5 52	18 06	3 33
8	15 07	12 47	5 50	18 02	3 29

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.5	0.1	0.1
30			
	0.5	0.1	0.1
45			
	0.5	0.1	0.1
60			
	0.5	0.0	0.0
75			
	0.5	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	5	6	7
°	′	′	′
0			
	20.5	20.6	20.4
4			
	20.5	20.6	20.4
8			
	20.5	20.6	20.3
12			
	20.4	20.5	20.3
16			
	20.3	20.4	20.2
20			
	20.2	20.4	20.1
24			
	20.1	20.2	20.0
28			
	20.0	20.1	19.9
32			
	19.8	20.0	19.7
36			
	19.7	19.8	19.6
40			
	19.5	19.6	19.4
44			
	19.3	19.4	19.2
48			
	19.1	19.2	19.0
52			
	18.9	19.0	18.8
56			
	18.7	18.8	18.6
60			
	18.4	18.5	18.4
64			
	18.2	18.3	18.1
68			
	17.9	18.0	17.9
72			
	17.7	17.7	17.6
76			
	17.4	17.5	17.4
80			
	17.2	17.2	17.1
84			
	16.9	16.9	16.9
88			
	16.7	16.7	16.7
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	5	6	7
°	′	′	′
0			
	12.7	12.6	12.8
4			
	12.7	12.7	12.8
8			
	12.8	12.7	12.8
12			
	12.8	12.8	12.9
16			
	12.9	12.8	13.0
20			
	13.0	12.9	13.1
24			
	13.1	13.0	13.2
28			
	13.2	13.2	13.3
32			
	13.4	13.3	13.4
36			
	13.5	13.5	13.6
40			
	13.7	13.7	13.8
44			
	13.9	13.9	13.9
48			
	14.1	14.1	14.1
52			
	14.3	14.3	14.3
56			
	14.5	14.5	14.6
60			
	14.8	14.8	14.8
64			
	15.0	15.0	15.0
68			
	15.3	15.3	15.3
72			
	15.5	15.5	15.5
76			
	15.8	15.8	15.8
80			
	16.1	16.1	16.1
84			
	16.3	16.4	16.3
88			
	16.5	16.6	16.5
90			

Subtract from table, back cover

New Moon 5

G M T	♈ GHA	VENUS −3.4 GHA	Dec.	MARS 0.6 GHA	Dec.	JUPITER −1.8 GHA	Dec.	SATURN 0.5 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
8 0	165 09.8	168 24.4	− 2 52.8	272 25.9	−21 53.8	88 44.5	+22 35.7	307 39.0	−12 02.5	141 49.5	75	+15 12.2	+133
1	180 12.3	183 24.0	51.5	287 27.0	54.0	103 46.7	35.7	322 41.5	02.5	156 16.0	75	15 25.5	+133
2	195 14.7	198 23.7	50.2	302 28.1	54.2	118 49.0	35.8	337 44.0	02.4	170 42.5	74	15 38.8	+131
3	210 17.2	213 23.3	·· 49.0	317 29.3	·· 54.4	133 51.2	·· 35.8	352 46.6	·· 02.4	185 08.9	74	·15 51.9	+130
4	225 19.7	228 22.9	47.7	332 30.4	54.5	148 53.4	35.8	7 49.1	02.4	199 35.3	73	16 04.9	+128
5	240 22.1	243 22.5	46.4	347 31.5	54.7	163 55.7	35.8	22 51.6	02.3	214 01.6	73	16 17.7	+128
6	255 24.6	258 22.1	− 2 45.2	2 32.6	−21 54.9	178 57.9	+22 35.9	37 54.2	−12 02.3	228 27.9	72	+16 30.5	+127
7	270 27.0	273 21.7	43.9	17 33.7	55.1	194 00.2	35.9	52 56.7	02.3	242 54.1	71	16 43.2	+125
8	285 29.5	288 21.4	42.6	32 34.8	55.3	209 02.4	35.9	67 59.3	02.2	257 20.2	71	16 55.7	+124
9	300 32.0	303 21.0	·· 41.3	47 35.9	·· 55.5	224 04.7	·· 35.9	83 01.8	·· 02.2	271 46.3	71	·17 08.1	+123
10	315 34.4	318 20.6	40.1	62 37.0	55.7	239 06.9	36.0	98 04.3	02.2	286 12.4	70	17 20.4	+122
11	330 36.9	333 20.2	38.8	77 38.2	55.9	254 09.1	36.0	113 06.9	02.1	300 38.4	69	17 32.6	+121
12	345 39.4	348 19.8	− 2 37.5	92 39.3	−21 56.0	269 11.4	+22 36.0	128 09.4	−12 02.1	315 04.3	69	+17 44.7	+119
13	0 41.8	3 19.4	36.2	107 40.4	56.2	284 13.6	36.1	143 12.0	02.1	329 30.2	69	17 56.6	+119
14	15 44.3	18 19.1	35.0	122 41.5	56.4	299 15.9	36.1	158 14.5	02.0	343 56.1	68	18 08.5	+117
15	30 46.8	33 18.7	·· 33.7	137 42.6	·· 56.6	314 18.1	·· 36.1	173 17.0	·· 02.0	358 21.9	67	·18 20.2	+115
16	45 49.2	48 18.3	32.4	152 43.7	56.8	329 20.3	36.1	188 19.6	02.0	12 47.6	67	18 31.7	+115
17	60 51.7	63 17.9	31.2	167 44.8	57.0	344 22.6	36.2	203 22.1	01.9	27 13.3	67	18 43.2	+113
18	75 54.1	78 17.5	− 2 29.9	182 46.0	−21 57.2	359 24.8	+22 36.2	218 24.7	−12 01.9	41 39.0	66	+18 54.5	+112
19	90 56.6	93 17.1	28.6	197 47.1	57.3	14 27.1	36.2	233 27.2	01.9	56 04.6	65	19 05.7	+110
20	105 59.1	108 16.8	27.3	212 48.2	57.5	29 29.3	36.2	248 29.7	01.8	70 30.1	65	19 16.7	+109
21	121 01.5	123 16.4	·· 26.1	227 49.3	·· 57.7	44 31.5	·· 36.3	263 32.3	·· 01.8	84 55.6	64	·19 27.6	+108
22	136 04.0	138 16.0	24.8	242 50.4	57.9	59 33.8	36.3	278 34.8	01.7	99 21.0	64	19 38.4	+106
23	151 06.5	153 15.6	23.5	257 51.5	58.1	74 36.0	36.3	293 37.4	01.7	113 46.4	64	19 49.0	+105
9 0	166 08.9	168 15.2	− 2 22.2	272 52.7	−21 58.3	89 38.3	+22 36.3	308 39.9	−12 01.7	128 11.8	63	+19 59.5	+104
1	181 11.4	183 14.9	21.0	287 53.8	58.5	104 40.5	36.4	323 42.4	01.6	142 37.1	62	20 09.9	+102
2	196 13.9	198 14.5	19.7	302 54.9	58.6	119 42.7	36.4	338 45.0	01.6	157 02.3	62	20 20.1	+101
3	211 16.3	213 14.1	·· 18.4	317 56.0	·· 58.8	134 45.0	·· 36.4	353 47.5	·· 01.6	171 27.5	62	·20 30.2	+ 99
4	226 18.8	228 13.7	17.1	332 57.1	59.0	149 47.2	36.4	8 50.1	01.5	185 52.7	61	20 40.1	+ 98
5	241 21.3	243 13.3	15.9	347 58.3	59.2	164 49.4	36.5	23 52.6	01.5	200 17.8	61	20 49.9	+ 97
6	256 23.7	258 13.0	− 2 14.6	2 59.4	−21 59.4	179 51.7	+22 36.5	38 55.2	−12 01.5	214 42.9	60	+20 59.6	+ 95
7	271 26.2	273 12.6	13.3	18 00.5	59.6	194 53.9	36.5	53 57.7	01.4	229 07.9	60	21 09.1	+ 94
8	286 28.6	288 12.2	12.1	33 01.6	59.7	209 56.1	36.5	69 00.2	01.4	243 32.9	59	21 18.5	+ 92
9	301 31.1	303 11.8	·· 10.8	48 02.7	·21 59.9	224 58.4	·· 36.6	84 02.8	·· 01.4	257 57.8	59	·21 27.7	+ 90
10	316 33.6	318 11.4	09.5	63 03.9	22 00.1	240 00.6	36.6	99 05.3	01.3	272 22.7	59	21 36.7	+ 89
11	331 36.0	333 11.1	08.2	78 05.0	00.3	255 02.8	36.6	114 07.9	01.3	286 47.6	58	21 45.6	+ 88
12	346 38.5	348 10.7	− 2 07.0	93 06.1	−22 00.5	270 05.1	+22 36.7	129 10.4	−12 01.3	301 12.4	58	+21 54.4	+ 86
13	1 41.0	3 10.3	05.7	108 07.2	00.6	285 07.3	36.7	144 13.0	01.2	315 37.2	57	22 03.0	+ 85
14	16 43.4	18 09.9	04.4	123 08.3	00.8	300 09.6	36.7	159 15.5	01.2	330 01.9	58	22 11.5	+ 83
15	31 45.9	33 09.5	·· 03.1	138 09.5	·· 01.0	315 11.8	·· 36.7	174 18.0	·· 01.2	344 26.7	56	·22 19.8	+ 81
16	46 48.4	48 09.2	01.8	153 10.6	01.2	330 14.0	36.8	189 20.6	01.1	358 51.3	57	22 27.9	+ 80
17	61 50.8	63 08.8	2 00.6	168 11.7	01.4	345 16.2	36.8	204 23.1	01.1	13 16.0	56	22 35.9	+ 78
18	76 53.3	78 08.4	− 1 59.3	183 12.8	−22 01.6	0 18.5	+22 36.8	219 25.7	−12 01.1	27 40.6	56	+22 43.7	+ 77
19	91 55.7	93 08.0	58.0	198 13.9	01.7	15 20.7	36.8	234 28.2	01.0	42 05.2	55	22 51.4	+ 75
20	106 58.2	108 07.6	56.7	213 15.1	01.9	30 22.9	36.9	249 30.8	01.0	56 29.7	55	22 58.9	+ 74
21	122 00.7	123 07.3	·· 55.5	228 16.2	·· 02.1	45 25.2	·· 36.9	264 33.3	·· 00.9	70 54.2	55	·23 06.3	+ 72
22	137 03.1	138 06.9	54.2	243 17.3	02.3	60 27.4	36.9	279 35.8	00.9	85 18.7	55	23 13.5	+ 71
23	152 05.6	153 06.5	52.9	258 18.4	02.5	75 29.6	37.0	294 38.4	00.9	99 43.2	54	23 20.6	+ 68
10 0	167 08.1	168 06.1	− 1 51.6	273 19.6	−22 02.6	90 31.9	+22 37.0	309 40.9	−12 00.8	114 07.6	54	+23 27.4	+ 68
1	182 10.5	183 05.8	50.4	288 20.7	02.8	105 34.1	37.0	324 43.5	00.8	128 32.0	54	23 34.2	+ 65
2	197 13.0	198 05.4	49.1	303 21.8	03.0	120 36.3	37.0	339 46.0	00.8	142 56.4	54	23 40.7	+ 64
3	212 15.5	213 05.0	·· 47.8	318 22.9	·· 03.2	135 38.6	·· 37.1	354 48.6	·· 00.7	157 20.8	53	·23 47.1	+ 63
4	227 17.9	228 04.6	46.5	333 24.0	03.4	150 40.8	37.1	9 51.1	00.7	171 45.1	54	23 53.4	+ 60
5	242 20.4	243 04.2	45.3	348 25.2	03.5	165 43.0	37.1	24 53.7	00.7	186 09.5	53	23 59.4	+ 59
6	257 22.9	258 03.9	− 1 44.0	3 26.3	−22 03.7	180 45.2	+22 37.1	39 56.2	−12 00.6	200 33.8	53	+24 05.3	+ 58
7	272 25.3	273 03.5	42.7	18 27.4	03.9	195 47.5	37.2	54 58.8	00.6	214 58.1	52	24 11.1	+ 56
8	287 27.8	288 03.1	41.4	33 28.5	04.1	210 49.7	37.2	70 01.3	00.6	229 22.3	53	24 16.7	+ 54
9	302 30.2	303 02.7	·· 40.2	48 29.7	·· 04.2	225 51.9	·· 37.2	85 03.9	·· 00.5	243 46.6	53	·24 22.1	+ 52
10	317 32.7	318 02.4	38.9	63 30.8	04.4	240 54.1	37.2	100 06.4	00.5	258 10.9	52	24 27.3	+ 51
11	332 35.2	333 02.0	37.6	78 31.9	04.6	255 56.4	37.3	115 08.9	00.4	272 35.1	53	24 32.4	+ 49
12	347 37.6	348 01.6	− 1 36.3	93 33.0	−22 04.8	270 58.6	+22 37.3	130 11.5	−12 00.4	286 59.4	52	+24 37.3	+ 48
13	2 40.1	3 01.2	35.0	108 34.2	05.0	286 00.8	37.3	145 14.0	00.4	301 23.6	52	24 42.1	+ 46
14	17 42.6	18 00.9	33.8	123 35.3	05.1	301 03.1	37.4	160 16.6	00.3	315 47.8	52	24 46.7	+ 44
15	32 45.0	33 00.5	·· 32.5	138 36.4	·· 05.3	316 05.3	·· 37.4	175 19.1	·· 00.3	330 12.0	53	·24 51.1	+ 42
16	47 47.5	48 00.1	31.2	153 37.6	05.5	331 07.5	37.4	190 21.7	00.3	344 36.3	52	24 55.3	+ 41
17	62 50.0	62 59.7	29.9	168 38.7	05.7	346 09.7	37.4	205 24.2	00.2	359 00.5	52	24 59.4	+ 39
18	77 52.4	77 59.4	− 1 28.7	183 39.8	−22 05.8	1 11.9	+22 37.5	220 26.8	−12 00.2	13 24.7	52	+25 03.3	+ 38
19	92 54.9	92 59.0	27.4	198 40.9	06.0	16 14.2	37.5	235 29.3	00.2	27 48.9	53	25 07.1	+ 35
20	107 57.4	107 58.6	26.1	213 42.1	06.2	31 16.4	37.5	250 31.9	00.1	42 13.2	52	25 10.6	+ 35
21	122 59.8	122 58.2	·· 24.8	228 43.2	·· 06.4	46 18.6	·· 37.5	265 34.4	·· 00.1	56 37.4	52	·25 14.1	+ 32
22	138 02.3	137 57.8	23.5	243 44.3	06.5	61 20.8	37.6	280 37.0	00.0	71 01.6	53	25 17.3	+ 31
23	153 04.7	152 57.5	22.3	258 45.4	06.7	76 23.1	37.6	295 39.5	00.0	85 25.9	53	25 20.4	+ 29
24	168 07.2	167 57.1	− 1 21.0	273 46.6	−22 06.9	91 25.3	+22 37.6	310 42.1	−12 00.0	99 50.2	53	+25 23.3	+ 27
code	—	− 4	+ 13	+ 11	− 1	+ 22	0	+ 26	+ 1				

GMT		SUN GHA	SUN Dec.
d	h	° ′	° ′
8	0	177 13.8	− 5 10.8
	1	192 14.0	09.8
	2	207 14.1	08.9
	3	222 14.3 ··	07.9
	4	237 14.4	06.9
	5	252 14.6	05.9
	6	267 14.7	− 5 05.0
	7	282 14.9	04.0
	8	297 15.0	03.0
	9	312 15.2 ··	02.0
	10	327 15.3	01.1
	11	342 15.5	5 00.1
	12	357 15.6	− 4 59.1
	13	12 15.8	58.1
	14	27 16.0	57.2
	15	42 16.1 ··	56.2
	16	57 16.3	55.2
	17	72 16.4	54.2
	18	87 16.6	− 4 53.3
	19	102 16.7	52.3
	20	117 16.9	51.3
	21	132 17.0 ··	50.3
	22	147 17.2	49.4
	23	162 17.3	48.4
9	0	177 17.5	− 4 47.4
	1	192 17.6	46.4
	2	207 17.8	45.5
	3	222 18.0 ··	44.5
	4	237 18.1	43.5
	5	252 18.3	42.5
	6	267 18.4	− 4 41.6
	7	282 18.6	40.6
	8	297 18.7	39.6
	9	312 18.9 ··	38.6
	10	327 19.0	37.6
	11	342 19.2	36.7
	12	357 19.4	− 4 35.7
	13	12 19.5	34.7
	14	27 19.7	33.7
	15	42 19.8 ··	32.8
	16	57 20.0	31.8
	17	72 20.1	30.8
	18	87 20.3	− 4 29.8
	19	102 20.5	28.9
	20	117 20.6	27.9
	21	132 20.8 ··	26.9
	22	147 20.9	25.9
	23	162 21.1	24.9
10	0	177 21.3	− 4 24.0
	1	192 21.4	23.0
	2	207 21.6	22.0
	3	222 21.7 ··	21.0
	4	237 21.9	20.0
	5	252 22.1	19.1
	6	267 22.2	− 4 18.1
	7	282 22.4	17.1
	8	297 22.5	16.1
	9	312 22.7 ··	15.2
	10	327 22.9	14.2
	11	342 23.0	13.2
	12	357 23.2	− 4 12.2
	13	12 23.3	11.2
	14	27 23.5	10.3
	15	42 23.7 ··	09.3
	16	57 23.8	08.3
	17	72 24.0	07.3
	18	87 24.1	− 4 06.3
	19	102 24.3	05.4
	20	117 24.5	04.4
	21	132 24.6 ··	03.4
	22	147 24.8	02.4
	23	162 24.9	01.4
	24	177 25.1	− 4 00.5
code		—	+ 10

STARS No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 52.2	−40 29.4
5	Achernar	336 00.0	−57 28.2
30	Acrux	173 58.6	−62 50.8
19	Adhara	255 47.3	−28 54.7
10	Aldebaran	291 40.4	+16 25.2
32	Alioth	166 58.9	+56 12.2
34	Alkaid	153 33.3	+49 32.1
55	Al Na'ir	28 39.8	−47 11.0
15	Alnilam	276 31.4	− 1 13.8
25	Alphard	218 39.4	− 8 27.7
41	Alphecca	126 48.4	+26 51.7
1	Alpheratz	358 29.9	+28 50.3
51	Altair	62 51.8	+ 8 44.6
2	Ankaa	353 59.7	−42 33.3
42	Antares	113 20.7	−26 20.0
37	Arcturus	146 36.0	+19 24.9
43	Atria	109 02.5	−68 56.6
22	Avior	234 35.9	−59 21.9
13	Bellatrix	279 19.6	+ 6 18.6
16	Betelg'se	271 49.3	+ 7 24.0
17	Canopus	264 15.7	−52 40.5
12	Capella	281 40.1	+45 57.4
53	Deneb	50 02.2	+45 06.7
28	Denebola	183 18.6	+14 49.4
4	Diphda	349 40.7	−18 14.3
27	Dubhe	194 45.2	+61 59.8
14	Elnath	279 08.8	+28 34.4
47	Eltanin	91 06.9	+51 29.2
54	Enif	34 31.0	+ 9 39.8
56	Fomalhaut	16 13.2	−29 51.9
31	Gacrux	172 50.1	−56 51.5
29	Gienah	176 37.8	−17 17.5
35	Hadar	149 50.7	−60 09.2
6	Hamal	328 51.2	+23 14.9
48	Kaus Aust.	84 42.8	−34 24.5
40	Kochab	137 16.9	+74 20.2
57	Markab	14 23.0	+14 57.5
8	Menkar	315 01.7	+ 3 54.7
36	Menkent	148 59.8	−36 08.8
24	Miapl'dus	221 48.7	−69 31.9
9	Mirfak	309 44.3	+49 42.2
50	Nunki	76 53.5	−26 21.4
52	Peacock	54 29.4	−56 52.9
21	Pollux	244 21.7	+28 08.3
20	Procyon	245 46.0	+ 5 20.5
46	R'alhague	96 47.7	+12 35.2
26	Regulus	208 30.4	+12 11.3
11	Rigel	281 54.7	− 8 15.3
38	Rigil Kent.	140 52.3	−60 38.9
44	Sabik	103 03.5	−15 40.3
3	Schedar	350 32.0	+56 17.3
45	Shaula	97 22.3	−37 04.3
18	Sirius	259 12.7	−16 39.3
33	Spica	159 17.9	−10 55.6
23	Suhail	223 24.9	−43 15.0
49	Vega	81 09.2	+38 44.1
39	Zub'g'bi	137 54.5	−15 51.3

Lat.	Sunrise	Twlt. begins	Moonrise 8	Moonrise 9	Moonrise 10	Moonrise 11
N °	h m	h m	h m	h m	h m	h m
72	6 57	3 00	4 34	☐	☐	☐
70	6 52	3 23	5 13	☐	☐	☐
68	6 48	3 39	5 41	5 03	☐	☐
66	6 44	3 52	6 02	5 46	5 03	☐
64	6 41	4 03	6 18	6 16	6 16	6 24
62	6 39	4 12	6 33	6 39	6 52	7 23
60	6 36	4 19	6 44	6 57	7 18	7 56
58	6 34	4 25	6 55	7 12	7 39	8 21
56	6 32	4 30	7 04	7 26	7 56	8 41
54	6 31	4 35	7 12	7 37	8 11	8 58
52	6 29	4 38	7 20	7 47	8 24	9 12
50	6 28	4 42	7 26	7 56	8 35	9 24
45	6 25	4 48	7 40	8 15	8 58	9 50
40	6 22	4 54	7 52	8 31	9 17	10 10
35	6 20	4 57	8 02	8 45	9 33	10 27
30	6 18	5 00	8 11	8 56	9 47	10 42
20	6 14	5 02	8 27	9 17	10 10	11 07
10	6 11	5 01	8 41	9 34	10 31	11 29
0	6 07	4 59	8 53	9 51	10 50	11 49
10	6 04	4 54	9 06	10 08	11 09	12 10
20	6 00	4 46	9 20	10 26	11 30	12 32
30	5 56	4 34	9 36	10 46	11 54	12 57
35	5 54	4 27	9 46	10 59	12 08	13 12
40	5 51	4 17	9 57	11 13	12 25	13 29
45	5 47	4 04	10 10	11 30	12 44	13 50
50	5 43	3 48	10 25	11 50	13 09	14 16
52	5 41	3 40	10 33	12 00	13 21	14 29
54	5 39	3 29	10 41	12 12	13 35	14 44
56	5 37	3 19	10 50	12 25	13 51	15 01
58	5 35	3 05	11 01	12 40	14 10	15 21
60	5 32	2 50	11 13	12 58	14 33	15 48
S						

Lat.	Sunset	Twlt. ends	Moonset 8	Moonset 9	Moonset 10	Moonset 11
N °	h m	h m	h m	h m	h m	h m
72	17 26	21 31	0 18	☐	☐	☐
70	17 31	21 07	☐	☐	☐	☐
68	17 35	20 49	25 53	1 53	☐	☐
66	17 39	20 35	25 09	1 09	3 57	☐
64	17 42	20 24	24 41	0 41	2 45	4 40
62	17 44	20 14	24 19	0 19	2 09	3 42
60	17 46	20 07	24 02	0 02	1 43	3 09
58	17 48	20 00	23 47	25 23	1 23	2 44
56	17 50	19 55	23 35	25 06	1 06	2 25
54	17 52	19 50	23 24	24 52	0 52	2 08
52	17 53	19 46	23 14	24 39	0 39	1 54
50	17 55	19 43	23 06	24 28	0 28	1 42
45	17 58	19 36	22 48	24 06	0 06	1 16
40	18 00	19 30	22 33	23 47	24 56	0 56
35	18 02	19 26	22 21	23 32	24 39	0 39
30	18 04	19 23	22 10	23 19	24 25	0 25
20	18 08	19 21	21 51	22 56	24 00	0 00
10	18 11	19 21	21 35	22 37	23 38	24 38
0	18 14	19 23	21 20	22 19	23 18	24 17
10	18 17	19 27	21 06	22 01	22 58	23 57
20	18 21	19 35	20 50	21 41	22 37	23 35
30	18 25	19 46	20 32	21 19	22 12	23 10
35	18 27	19 53	20 21	21 06	21 58	22 55
40	18 30	20 03	20 09	20 51	21 41	22 38
45	18 33	20 15	19 55	20 34	21 21	22 17
50	18 37	20 31	19 38	20 12	20 55	21 51
52	18 39	20 39	19 30	20 01	20 43	21 38
54	18 41	20 48	19 21	19 50	20 29	21 23
56	18 43	20 58	19 11	19 36	20 13	21 06
58	18 45	21 10	19 00	19 21	19 54	20 46
60	18 48	21 26	18 47	19 02	19 30	20 20
S						

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.4	0.1	0.1
30	0.4	0.1	0.1
45	0.4	0.1	0.1
60	0.4	0.0	0.0
75	0.4	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	8	9	10
°	′	′	′
0	19.9	19.1	18.1
4	19.9	19.1	18.1
8	19.8	19.1	18.1
12	19.8	19.0	18.0
16	19.7	19.0	18.0
20	19.6	18.9	18.0
24	19.5	18.8	17.9
28	19.4	18.7	17.8
32	19.3	18.6	17.8
36	19.2	18.5	17.7
40	19.0	18.4	17.6
44	18.8	18.3	17.5
48	18.7	18.1	17.4
52	18.5	18.0	17.3
56	18.3	17.8	17.2
60	18.1	17.6	17.0
64	17.9	17.5	16.9
68	17.6	17.3	16.8
72	17.4	17.1	16.6
76	17.2	16.9	16.5
80	17.0	16.7	16.4
84	16.7	16.5	16.2
88	16.5	16.4	16.1
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	8	9	10
°	′	′	′
0	13.1	13.5	14.1
4	13.1	13.5	14.1
8	13.1	13.6	14.1
12	13.2	13.6	14.2
16	13.2	13.6	14.2
20	13.3	13.7	14.2
24	13.4	13.8	14.3
28	13.5	13.9	14.4
32	13.7	14.0	14.4
36	13.8	14.1	14.5
40	13.9	14.2	14.6
44	14.1	14.4	14.7
48	14.3	14.5	14.8
52	14.5	14.7	14.9
56	14.7	14.8	15.0
60	14.9	15.0	15.2
64	15.1	15.2	15.3
68	15.3	15.4	15.4
72	15.5	15.5	15.5
76	15.8	15.7	15.7
80	16.0	15.9	15.8
84	16.2	16.1	16.0
88	16.4	16.3	16.1
90			

Subtract from table, back cover

Equation of Time (App.—Mean)

GMT	8	9	10
h	m s	m s	m s
0	−11 05.0	−10 50.4	−10 35.3
6	−11 01.4	−10 46.6	−10 31.5
12	−10 57.7	−10 42.9	−10 27.6
18	−10 54.0	−10 39.1	−10 23.8
24	−10 50.4	−10 35.3	−10 19.9

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
8	15 07	12 47	5 50	18 02	3 29
9	16 05	12 47	5 48	17 59	3 25
10	17 04	12 48	5 46	17 55	3 21
11	18 03	12 49	5 45	17 52	3 17

GMT		♈ GHA	VENUS −3.4 GHA	VENUS Dec.	MARS 0.5 GHA	MARS Dec.	JUPITER −1.8 GHA	JUPITER Dec.	SATURN 0.5 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
11	0	168 07.2	167 57.1	−1 21.0	273 46.6	−22 06.9	91 25.3	+22 37.6	310 42.1	−12 00.0	99 50.2	53	+25 23.3	+27
	1	183 09.7	182 56.7	19.7	288 47.7	07.1	106 27.5	37.7	325 44.6	11 59.9	114 14.5	52	25 26.0	+26
	2	198 12.1	197 56.3	18.4	303 48.8	07.3	121 29.7	37.7	340 47.2	59.9	128 38.7	54	25 28.6	+24
	3	213 14.6	212 56.0	•• 17.1	318 50.0	•• 07.4	136 32.0	•• 37.7	355 49.7	•• 59.9	143 03.1	53	·25 31.0	+22
	4	228 17.1	227 55.6	15.9	333 51.1	07.6	151 34.2	37.7	10 52.3	59.8	157 27.4	53	25 33.2	+21
	5	243 19.5	242 55.2	14.6	348 52.2	07.8	166 36.4	37.8	25 54.8	59.8	171 51.7	54	25 35.3	+19
	6	258 22.0	257 54.8	−1 13.3	3 53.4	−22 08.0	181 38.6	+22 37.8	40 57.4	−11 59.8	186 16.1	54	+25 37.2	+18
	7	273 24.5	272 54.5	12.0	18 54.5	08.1	196 40.8	37.8	55 59.9	59.7	200 40.5	54	25 39.0	+15
	8	288 26.9	287 54.1	10.8	33 55.6	08.3	211 43.1	37.8	71 02.5	59.7	215 04.9	55	25 40.5	+14
	9	303 29.4	302 53.7	•• 09.5	48 56.7	•• 08.5	226 45.3	•• 37.9	86 05.0	•• 59.6	229 29.4	54	·25 41.9	+13
	10	318 31.9	317 53.3	08.2	63 57.9	08.6	241 47.5	37.9	101 07.6	59.6	243 53.8	55	25 43.2	+10
	11	333 34.3	332 53.0	06.9	78 59.0	08.8	256 49.7	37.9	116 10.1	59.6	258 18.3	56	25 44.2	+10
	12	348 36.8	347 52.6	−1 05.6	94 00.1	−22 09.0	271 51.9	+22 38.0	131 12.7	−11 59.5	272 42.9	55	+25 45.2	+7
	13	3 39.2	2 52.2	04.4	109 01.3	09.2	286 54.2	38.0	146 15.2	59.5	287 07.4	56	25 45.9	+6
	14	18 41.7	17 51.9	03.1	124 02.4	09.3	301 56.4	38.0	161 17.8	59.5	301 32.0	57	25 46.5	+4
	15	33 44.2	32 51.5	•• 01.8	139 03.5	•• 09.5	316 58.6	•• 38.0	176 20.3	•• 59.4	315 56.7	57	·25 46.9	+2
	16	48 46.6	47 51.1	1 00.5	154 04.7	09.7	332 00.8	38.1	191 22.9	59.4	330 21.4	57	25 47.1	+1
	17	63 49.1	62 50.7	0 59.2	169 05.8	09.9	347 03.0	38.1	206 25.4	59.3	344 46.1	57	25 47.2	0
	18	78 51.6	77 50.4	−0 58.0	184 06.9	−22 10.0	2 05.2	+22 38.1	221 28.0	−11 59.3	359 10.8	58	+25 47.2	−3
	19	93 54.0	92 50.0	56.7	199 08.1	10.2	17 07.5	38.2	236 30.5	59.3	13 35.6	59	25 46.9	−4
	20	108 56.5	107 49.6	55.4	214 09.2	10.4	32 09.7	38.2	251 33.1	59.2	28 00.5	59	25 46.5	−5
	21	123 59.0	122 49.2	•• 54.1	229 10.3	•• 10.5	47 11.9	•• 38.2	266 35.6	•• 59.2	42 25.4	59	·25 46.0	−7
	22	139 01.4	137 48.9	52.8	244 11.5	10.7	62 14.1	38.2	281 38.2	59.2	56 50.3	60	25 45.3	−9
	23	154 03.9	152 48.5	51.6	259 12.6	10.9	77 16.3	38.3	296 40.7	59.1	71 15.3	61	25 44.4	−10
12	0	169 06.4	167 48.1	−0 50.3	274 13.7	−22 11.1	92 18.5	+22 38.3	311 43.3	−11 59.1	85 40.4	60	+25 43.4	−12
	1	184 08.8	182 47.7	49.0	289 14.9	11.2	107 20.7	38.3	326 45.9	59.0	100 05.4	62	25 42.2	−14
	2	199 11.3	197 47.4	47.7	304 16.0	11.4	122 23.0	38.3	341 48.4	59.0	114 30.6	62	25 40.8	−15
	3	214 13.7	212 47.0	•• 46.4	319 17.2	•• 11.6	137 25.2	•• 38.4	356 51.0	•• 59.0	128 55.8	63	·25 39.3	−16
	4	229 16.2	227 46.6	45.2	334 18.3	11.7	152 27.4	38.4	11 53.5	58.9	143 21.1	63	25 37.7	−18
	5	244 18.7	242 46.3	43.9	349 19.4	11.9	167 29.6	38.4	26 56.1	58.9	157 46.4	63	25 35.9	−20
	6	259 21.1	257 45.9	−0 42.6	4 20.6	−22 12.1	182 31.8	+22 38.5	41 58.6	−11 58.9	172 11.7	65	+25 33.9	−21
	7	274 23.6	272 45.5	41.3	19 21.7	12.3	197 34.0	38.5	57 01.2	58.8	186 37.2	65	25 31.8	−23
	8	289 26.1	287 45.1	40.0	34 22.8	12.4	212 36.2	38.5	72 03.7	58.8	201 02.7	65	25 29.5	−24
	9	304 28.5	302 44.8	•• 38.8	49 24.0	•• 12.6	227 38.5	•• 38.5	87 06.3	•• 58.7	215 28.2	67	·25 27.1	−26
	10	319 31.0	317 44.4	37.5	64 25.1	12.8	242 40.7	38.6	102 08.8	58.7	229 53.9	66	25 24.5	−27
	11	334 33.5	332 44.0	36.2	79 26.2	12.9	257 42.9	38.6	117 11.4	58.7	244 19.5	68	25 21.8	−29
	12	349 35.9	347 43.6	−0 34.9	94 27.4	−22 13.1	272 45.1	+22 38.6	132 13.9	−11 58.6	258 45.3	68	+25 18.9	−30
	13	4 38.4	2 43.3	33.6	109 28.5	13.3	287 47.3	38.7	147 16.5	58.6	273 11.1	69	25 15.9	−32
	14	19 40.8	17 42.9	32.4	124 29.7	13.4	302 49.5	38.7	162 19.1	58.5	287 37.0	70	25 12.7	−33
	15	34 43.3	32 42.5	•• 31.1	139 30.8	•• 13.6	317 51.7	•• 38.7	177 21.6	•• 58.5	302 03.0	70	·25 09.4	−35
	16	49 45.8	47 42.2	29.8	154 31.9	13.8	332 53.9	38.7	192 24.2	58.5	316 29.0	71	25 05.9	−36
	17	64 48.2	62 41.8	28.5	169 33.1	13.9	347 56.1	38.8	207 26.7	58.4	330 55.1	72	25 02.3	−37
	18	79 50.7	77 41.4	−0 27.2	184 34.2	−22 14.1	2 58.3	+22 38.8	222 29.3	−11 58.4	345 21.3	72	+24 58.6	−39
	19	94 53.2	92 41.0	26.0	199 35.4	14.3	18 00.6	38.8	237 31.8	58.4	359 47.5	74	24 54.7	−41
	20	109 55.6	107 40.7	24.7	214 36.5	14.4	33 02.8	38.9	252 34.4	58.3	14 13.9	74	24 50.6	−41
	21	124 58.1	122 40.3	•• 23.4	229 37.6	•• 14.6	48 05.0	•• 38.9	267 36.9	•• 58.3	28 40.3	75	·24 46.5	−43
	22	140 00.6	137 39.9	22.1	244 38.8	14.8	63 07.2	38.9	282 39.5	58.2	43 06.8	75	24 42.2	−45
	23	155 03.0	152 39.6	20.8	259 39.9	15.0	78 09.4	38.9	297 42.1	58.2	57 33.3	77	24 37.7	−46
13	0	170 05.5	167 39.2	−0 19.6	274 41.1	−22 15.1	93 11.6	+22 39.0	312 44.6	−11 58.2	72 00.0	77	+24 33.1	−47
	1	185 08.0	182 38.8	18.3	289 42.2	15.3	108 13.8	39.0	327 47.2	58.1	86 26.7	78	24 28.4	−49
	2	200 10.4	197 38.5	17.0	304 43.3	15.5	123 16.0	39.0	342 49.7	58.1	100 53.5	78	24 23.5	−50
	3	215 12.9	212 38.1	•• 15.7	319 44.5	•• 15.6	138 18.2	•• 39.0	357 52.3	•• 58.0	115 20.3	80	·24 18.5	−51
	4	230 15.3	227 37.7	14.4	334 45.6	15.8	153 20.4	39.1	12 54.8	58.0	129 47.3	81	24 13.4	−52
	5	245 17.8	242 37.3	13.1	349 46.8	16.0	168 22.6	39.1	27 57.4	58.0	144 14.4	81	24 08.2	−54
	6	260 20.3	257 37.0	−0 11.9	4 47.9	−22 16.1	183 24.8	+22 39.1	42 59.9	−11 57.9	158 41.5	82	+24 02.8	−55
	7	275 22.7	272 36.6	10.6	19 49.1	16.3	198 27.0	39.2	58 02.5	57.9	173 08.7	83	23 57.3	−57
	8	290 25.2	287 36.2	09.3	34 50.2	16.4	213 29.2	39.2	73 05.1	57.9	187 36.0	84	23 51.6	−58
	9	305 27.7	302 35.9	•• 08.0	49 51.3	•• 16.6	228 31.4	•• 39.2	88 07.6	•• 57.8	202 03.4	84	·23 45.8	−59
	10	320 30.1	317 35.5	06.7	64 52.5	16.8	243 33.7	39.2	103 10.2	57.8	216 30.8	86	23 39.9	−60
	11	335 32.6	332 35.1	05.5	79 53.6	16.9	258 35.9	39.3	118 12.7	57.7	230 58.4	86	23 33.9	−61
	12	350 35.1	347 34.7	−0 04.2	94 54.8	−22 17.1	273 38.1	+22 39.3	133 15.3	−11 57.7	245 26.0	87	+23 27.8	−63
	13	5 37.5	2 34.4	02.9	109 55.9	17.3	288 40.3	39.3	148 17.9	57.7	259 53.7	88	23 21.5	−64
	14	20 40.0	17 34.0	01.6	124 57.1	17.4	303 42.5	39.4	163 20.4	57.6	274 21.5	89	23 15.1	−65
	15	35 42.5	32 33.6	−0 00.3	139 58.2	•• 17.6	318 44.7	•• 39.4	178 23.0	•• 57.6	288 49.4	90	·23 08.6	−66
	16	50 44.9	47 33.3	+0 00.9	154 59.4	17.8	333 46.9	39.4	193 25.5	57.5	303 17.4	91	23 02.0	−68
	17	65 47.4	62 32.9	02.2	170 00.5	17.9	348 49.1	39.4	208 28.1	57.5	317 45.5	92	22 55.2	−69
	18	80 49.8	77 32.5	+0 03.5	185 01.6	−22 18.1	3 51.3	+22 39.5	223 30.6	−11 57.5	332 13.7	92	+22 48.3	−69
	19	95 52.3	92 32.2	04.8	200 02.8	18.3	18 53.5	39.5	238 33.2	57.4	346 41.9	93	22 41.4	−71
	20	110 54.8	107 31.8	06.1	215 03.9	18.4	33 55.7	39.5	253 35.8	57.4	1 10.2	95	22 34.3	−72
	21	125 57.2	122 31.4	•• 07.4	230 05.1	•• 18.6	48 57.9	•• 39.6	268 38.3	•• 57.3	15 38.7	95	·22 27.1	−74
	22	140 59.7	137 31.0	08.6	245 06.2	18.8	64 00.1	39.6	283 40.9	57.3	30 07.2	96	22 19.7	−74
	23	156 02.2	152 30.7	09.9	260 07.4	18.9	79 02.3	39.6	298 43.4	57.3	44 35.8	97	22 12.3	−75
	24	171 04.6	167 30.3	+0 11.2	275 08.5	−22 19.1	94 04.5	+22 39.6	313 46.0	−11 57.2	59 04.5	98	+22 04.8	−77
code		—	−3	+13	+11	−2	+22	+1	+26	0				

Day	GMT h	SUN GHA ° ′	Dec. ° ′
11	0	177 25.1	− 4 00.5
	1	192 25.3	3 59.5
	2	207 25.4	58.5
	3	222 25.6 ••	57.5
	4	237 25.8	56.5
	5	252 25.9	55.6
	6	267 26.1	− 3 54.6
	7	282 26.3	53.6
	8	297 26.4	52.6
	9	312 26.6 ••	51.6
	10	327 26.7	50.7
	11	342 26.9	49.7
	12	357 27.1	− 3 48.7
	13	12 27.2	47.7
	14	27 27.4	46.7
	15	42 27.6 ••	45.7
	16	57 27.7	44.8
	17	72 27.9	43.8
	18	87 28.1	− 3 42.8
	19	102 28.2	41.8
	20	117 28.4	40.8
	21	132 28.6 ••	39.9
	22	147 28.7	38.9
	23	162 28.9	37.9
12	0	177 29.1	− 3 36.9
	1	192 29.2	35.9
	2	207 29.4	34.9
	3	222 29.6 ••	34.0
	4	237 29.7	33.0
	5	252 29.9	32.0
	6	267 30.1	− 3 31.0
	7	282 30.2	30.0
	8	297 30.4	29.1
	9	312 30.6 ••	28.1
	10	327 30.7	27.1
	11	342 30.9	26.1
	12	357 31.1	− 3 25.1
	13	12 31.2	24.1
	14	27 31.4	23.2
	15	42 31.6 ••	22.2
	16	57 31.7	21.2
	17	72 31.9	20.2
	18	87 32.1	− 3 19.2
	19	102 32.2	18.2
	20	117 32.4	17.3
	21	132 32.6 ••	16.3
	22	147 32.7	15.3
	23	162 32.9	14.3
13	0	177 33.1	− 3 13.3
	1	192 33.2	12.3
	2	207 33.4	11.4
	3	222 33.6 ••	10.4
	4	237 33.8	09.4
	5	252 33.9	08.4
	6	267 34.1	− 3 07.4
	7	282 34.3	06.4
	8	297 34.4	05.5
	9	312 34.6 ••	04.5
	10	327 34.8	03.5
	11	342 34.9	02.5
	12	357 35.1	− 3 01.5
	13	12 35.3	3 00.5
	14	27 35.5	2 59.5
	15	42 35.6 ••	58.6
	16	57 35.8	57.6
	17	72 36.0	56.6
	18	87 36.1	− 2 55.6
	19	102 36.3	54.6
	20	117 36.5	53.6
	21	132 36.7 ••	52.7
	22	147 36.8	51.7
	23	162 37.0	50.7
	24	177 37.2	− 2 49.7
	code	—	+ 10

STARS

No.	Name	SHA ° ′	Dec. ° ′
7	Acamar	315 52.2	−40 29.4
5	Achernar	336 00.0	−57 28.2
30	Acrux	173 58.6	−62 50.8
19	Adhara	255 47.3	−28 54.7
10	Aldebaran	291 40.5	+16 25.2
32	Alioth	166 58.9	+56 12.2
34	Alkaid	153 33.3	+49 32.1
55	Al Na'ir	28 39.7	−47 11.0
15	Alnilam	276 31.4	− 1 13.8
25	Alphard	218 39.5	− 8 27.7
41	Alphecca	126 48.4	+26 51.7
1	Alpheratz	358 29.9	+28 50.3
51	Altair	62 51.7	+ 8 44.6
2	Ankaa	353 59.7	−42 33.3
42	Antares	113 20.7	−26 20.0
37	Arcturus	146 36.0	+19 24.9
43	Atria	109 02.5	−68 56.7
22	Avior	234 35.9	−59 22.0
13	Bellatrix	279 19.7	+ 6 18.6
16	Betelg'se	271 49.3	+ 7 24.0
17	Canopus	264 15.8	−52 40.5
12	Capella	281 40.2	+45 57.4
53	Deneb	50 02.2	+45 06.7
28	Denebola	183 18.5	+14 49.4
4	Diphda	349 40.7	−18 14.3
27	Dubhe	194 45.2	+61 59.8
14	Elnath	279 08.8	+28 34.4
47	Eltanin	91 06.8	+51 29.2
54	Enif	34 31.0	+ 9 39.7
56	Fomalhaut	16 13.2	−29 51.9
31	Gacrux	172 50.1	−56 51.5
29	Gienah	176 37.8	−17 17.5
35	Hadar	149 50.7	−60 09.2
6	Hamal	328 51.2	+23 14.9
48	Kaus Aust.	84 42.8	−34 24.5
40	Kochab	137 16.9	+74 20.2
57	Markab	14 22.9	+14 57.5
8	Menkar	315 01.7	+ 3 54.7
36	Menkent	148 59.8	−36 08.8
24	Miapl'dus	221 48.7	−69 31.9
9	Mirfak	309 44.3	+49 42.2
50	Nunki	76 53.4	−26 21.4
52	Peacock	54 29.4	−56 52.9
21	Pollux	244 21.8	+28 08.3
20	Procyon	245 46.0	+ 5 20.5
46	R'alhague	96 47.7	+12 35.2
26	Regulus	208 30.4	+12 11.3
11	Rigel	281 54.8	− 8 15.3
38	Rigil Kent.	140 52.2	−60 38.9
44	Sabik	103 03.5	−15 40.3
3	Schedar	350 32.0	+56 17.3
45	Shaula	97 22.3	−37 04.3
18	Sirius	259 12.8	−16 39.3
33	Spica	159 17.8	−10 55.6
23	Suhail	223 24.9	−43 15.1
49	Vega	81 09.2	+38 44.1
39	Zub'g'bi	137 54.4	−15 51.3

Lat. °	Sunrise h m	Twlt. begins h m	Moonrise 11 h m	12 h m	13 h m	14 h m
N 72	6 42	2 37	□	□	□	□
70	6 38	3 04	□	□	□	□
68	6 36	3 24	□	□	□	9 49
66	6 33	3 39	□	□	8 06	10 37
64	6 31	3 51	6 24	7 28	9 18	11 07
62	6 29	4 01	7 23	8 25	9 54	11 30
60	6 27	4 09	7 56	8 58	10 19	11 48
58	6 26	4 16	8 21	9 22	10 39	12 03
56	6 25	4 22	8 41	9 42	10 56	12 16
54	6 23	4 27	8 58	9 58	11 10	12 27
52	6 22	4 32	9 12	10 12	11 23	12 37
50	6 21	4 36	9 24	10 25	11 33	12 46
45	6 19	4 43	9 50	10 50	11 56	13 05
40	6 17	4 49	10 10	11 10	12 14	13 20
35	6 16	4 53	10 27	11 27	12 29	13 32
30	6 14	4 56	10 42	11 42	12 43	13 43
20	6 12	4 59	11 07	12 06	13 05	14 02
10	6 09	5 00	11 29	12 28	13 24	14 19
0	6 07	4 58	11 49	12 47	13 43	14 34
10	6 04	4 54	12 10	13 07	14 01	14 49
20	6 01	4 47	12 32	13 29	14 20	15 05
30	5 58	4 36	12 57	13 53	14 42	15 24
35	5 56	4 29	13 12	14 08	14 55	15 35
40	5 54	4 21	13 29	14 24	15 10	15 47
45	5 51	4 09	13 50	14 44	15 27	16 02
50	5 48	3 53	14 16	15 09	15 49	16 19
52	5 47	3 46	14 29	15 21	16 00	16 28
54	5 45	3 37	14 44	15 35	16 11	16 37
56	5 43	3 27	15 01	15 51	16 25	16 47
58	5 41	3 16	15 21	16 10	16 40	16 59
S 60	5 39	3 02	15 48	16 34	16 59	17 13

Lat. °	Sunset h m	Twlt. ends h m	Moonset 11 h m	12 h m	13 h m	14 h m
N 72	17 40	21 54	□	□	□	□
70	17 43	21 24	□	□	□	□
68	17 46	21 03	□	□	□	7 06
66	17 48	20 47	□	□	6 59	6 18
64	17 50	20 34	4 40	5 39	5 47	5 46
62	17 52	20 24	3 42	4 43	5 11	5 23
60	17 54	20 16	3 09	4 10	4 45	5 04
58	17 55	20 08	2 44	3 45	4 24	4 48
56	17 56	20 01	2 25	3 25	4 07	4 35
54	17 57	19 56	2 08	3 09	3 52	4 23
52	17 58	19 51	1 54	2 55	3 40	4 13
50	17 59	19 47	1 42	2 42	3 29	4 03
45	18 01	19 39	1 16	2 17	3 05	3 44
40	18 03	19 33	0 56	1 56	2 46	3 28
35	18 05	19 29	0 39	1 39	2 31	3 14
30	18 06	19 26	0 25	1 24	2 17	3 03
20	18 09	19 22	0 00	0 59	1 54	2 42
10	18 11	19 21	24 38	0 38	1 33	2 24
0	18 13	19 22	24 17	0 17	1 14	2 08
10	18 15	19 25	23 57	24 55	0 55	1 51
20	18 18	19 32	23 35	24 35	0 35	1 33
30	18 21	19 41	23 10	24 11	0 11	1 12
35	18 23	19 49	22 55	23 56	25 00	1 00
40	18 25	19 57	22 38	23 40	24 45	0 45
45	18 28	20 09	22 17	23 21	24 28	0 28
50	18 31	20 23	21 51	22 56	24 08	0 08
52	18 32	20 30	21 38	22 44	23 58	25 13
54	18 34	20 39	21 23	22 31	23 46	25 04
56	18 35	20 48	21 06	22 15	23 33	24 55
58	18 37	20 59	20 46	21 56	23 18	24 43
S 60	18 39	21 13	20 20	21 33	23 00	24 30

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0			
	0.4	0.1	0.1
30			
	0.4	0.1	0.1
45			
	0.4	0.1	0.1
60			
	0.4	0.0	0.0
75			
	0.4	0.0	0.0
90			

Moon's Lower Limb Add

Alt. °	11 ′	12 ′	13 ′
0			
	17.2	16.2	15.3
4			
	17.2	16.2	15.3
8			
	17.2	16.2	15.3
12			
	17.2	16.2	15.3
16			
	17.1	16.2	15.3
20			
	17.1	16.2	15.3
24			
	17.1	16.1	15.3
28			
	17.0	16.1	15.3
32			
	17.0	16.1	15.3
36			
	16.9	16.1	15.3
40			
	16.9	16.1	15.3
44			
	16.8	16.0	15.4
48			
	16.7	16.0	15.4
52			
	16.7	16.0	15.4
56			
	16.6	16.0	15.4
60			
	16.5	15.9	15.4
64			
	16.4	15.9	15.4
68			
	16.4	15.9	15.4
72			
	16.3	15.8	15.4
76			
	16.2	15.8	15.5
80			
	16.1	15.8	15.5
84			
	16.0	15.7	15.5
88			
	15.9	15.7	15.5
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt. °	11 ′	12 ′	13 ′
0			
	14.6	15.2	15.7
4			
	14.6	15.2	15.7
8			
	14.6	15.2	15.7
12			
	14.6	15.2	15.7
16			
	14.7	15.2	15.7
20			
	14.7	15.2	15.7
24			
	14.7	15.2	15.7
28			
	14.8	15.3	15.7
32			
	14.8	15.3	15.7
36			
	14.9	15.3	15.7
40			
	14.9	15.3	15.6
44			
	15.0	15.3	15.6
48			
	15.1	15.4	15.6
52			
	15.1	15.4	15.6
56			
	15.2	15.4	15.6
60			
	15.3	15.5	15.6
64			
	15.4	15.5	15.6
68			
	15.5	15.5	15.6
72			
	15.5	15.5	15.6
76			
	15.6	15.6	15.5
80			
	15.7	15.6	15.5
84			
	15.8	15.7	15.5
88			
	15.9	15.7	15.5
90			

Subtract from table, back cover

Equation of Time (App.—Mean)

GMT h	11 m s	12 m s	13 m s
0	−10 19.9	−10 04.1	− 9 48.0
6	−10 16.0	−10 00.1	− 9 44.0
12	−10 12.0	− 9 56.1	− 9 39.9
18	−10 08.1	− 9 52.1	− 9 35.8
24	−10 04.1	− 9 48.0	− 9 31.6

GMT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
11	18 03	12 49	5 45	17 52	3 17
12	19 01	12 49	5 43	17 48	3 13
13	19 55	12 50	5 41	17 45	3 09
14	20 46	12 50	5 39	17 41	3 04

First Quarter 11

GMT	♈ GHA	VENUS −3.4 GHA	VENUS Dec.	MARS 0.5 GHA	MARS Dec.	JUPITER −1.8 GHA	JUPITER Dec.	SATURN 0.5 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
14 0	171 04.6	167 30.3	+ 0 11.2	275 08.5	−22 19.1	94 04.5	+22 39.6	313 46.0	−11 57.2	59 04.5	98	+22 04.8	−77
1	186 07.1	182 29.9	12.5	290 09.7	19.2	109 06.7	39.7	328 48.6	57.2	73 33.3	99	21 57.1	−78
2	201 09.6	197 29.6	13.8	305 10.8	19.4	124 08.9	39.7	343 51.1	57.1	88 02.2	99	21 49.3	−78
3	216 12.0	212 29.2	·· 15.0	320 12.0	·· 19.6	139 11.1	·· 39.7	358 53.7	·· 57.1	102 31.1	101	·21 41.5	−80
4	231 14.5	227 28.8	16.3	335 13.1	19.7	154 13.3	39.8	13 56.2	57.1	117 00.2	101	21 33.5	−81
5	246 17.0	242 28.5	17.6	350 14.3	19.9	169 15.5	39.8	28 58.8	57.0	131 29.3	102	21 25.4	−81
6	261 19.4	257 28.1	+ 0 18.9	5 15.4	−22 20.1	184 17.7	+22 39.8	44 01.4	−11 57.0	145 58.5	104	+21 17.3	−83
7	276 21.9	272 27.7	20.2	20 16.6	20.2	199 19.9	39.8	59 03.9	56.9	160 27.9	104	21 09.0	−84
8	291 24.3	287 27.3	21.5	35 17.7	20.4	214 22.1	39.9	74 06.5	56.9	174 57.3	105	21 00.6	−85
9	306 26.8	302 27.0	·· 22.7	50 18.9	·· 20.5	229 24.3	·· 39.9	89 09.1	·· 56.9	189 26.8	106	·20 52.1	−85
10	321 29.3	317 26.6	24.0	65 20.0	20.7	244 26.5	39.9	104 11.6	56.8	203 56.4	106	20 43.6	−87
11	336 31.7	332 26.2	25.3	80 21.2	20.9	259 28.7	40.0	119 14.2	56.8	218 26.0	108	20 34.9	−88
12	351 34.2	347 25.9	+ 0 26.6	95 22.3	−22 21.0	274 30.9	+22 40.0	134 16.7	−11 56.7	232 55.8	109	+20 26.1	−88
13	6 36.7	2 25.5	27.9	110 23.5	21.2	289 33.1	40.0	149 19.3	56.7	247 25.7	109	20 17.3	−90
14	21 39.1	17 25.1	29.1	125 24.6	21.3	304 35.2	40.0	164 21.9	56.7	261 55.6	111	20 08.3	−90
15	36 41.6	32 24.8	·· 30.4	140 25.8	·· 21.5	319 37.4	·· 40.1	179 24.4	·· 56.6	276 25.7	111	·19 59.3	−92
16	51 44.1	47 24.4	31.7	155 26.9	21.7	334 39.6	40.1	194 27.0	56.6	290 55.8	112	19 50.1	−92
17	66 46.5	62 24.0	33.0	170 28.1	21.8	349 41.8	40.1	209 29.5	56.5	305 26.0	113	19 40.9	−93
18	81 49.0	77 23.7	+ 0 34.3	185 29.2	−22 22.0	4 44.0	+22 40.2	224 32.1	−11 56.5	319 56.3	113	+19 31.6	−94
19	96 51.4	92 23.3	35.6	200 30.4	22.1	19 46.2	40.2	239 34.7	56.5	334 26.6	115	19 22.2	−95
20	111 53.9	107 22.9	36.8	215 31.5	22.3	34 48.4	40.2	254 37.2	56.4	348 57.1	116	19 12.7	−96
21	126 56.4	122 22.6	·· 38.1	230 32.7	·· 22.5	49 50.6	·· 40.3	269 39.8	·· 56.4	3 27.7	116	·19 03.1	−96
22	141 58.8	137 22.2	39.4	245 33.8	22.6	64 52.8	40.3	284 42.4	56.3	17 58.3	117	18 53.5	−98
23	157 01.3	152 21.8	40.7	260 35.0	22.8	79 55.0	40.3	299 44.9	56.3	32 29.0	118	18 43.7	−98
15 0	172 03.8	167 21.4	+ 0 42.0	275 36.1	−22 22.9	94 57.2	+22 40.3	314 47.5	−11 56.2	46 59.8	119	+18 33.9	−99
1	187 06.2	182 21.1	43.2	290 37.3	23.1	109 59.4	40.4	329 50.1	56.2	61 30.7	120	18 24.0	−100
2	202 08.7	197 20.7	44.5	305 38.5	23.3	125 01.6	40.4	344 52.6	56.2	76 01.7	121	18 14.0	−100
3	217 11.2	212 20.3	·· 45.8	320 39.6	·· 23.4	140 03.8	·· 40.4	359 55.2	·· 56.1	90 32.8	121	·18 04.0	−101
4	232 13.6	227 20.0	47.1	335 40.8	23.6	155 06.0	40.5	14 57.7	56.1	105 03.9	122	17 53.9	−103
5	247 16.1	242 19.6	48.4	350 41.9	23.7	170 08.2	40.5	30 00.3	56.0	119 35.1	123	17 43.6	−102
6	262 18.6	257 19.2	+ 0 49.7	5 43.1	−22 23.9	185 10.3	+22 40.5	45 02.9	−11 56.0	134 06.4	124	+17 33.4	−104
7	277 21.0	272 18.9	50.9	20 44.2	24.0	200 12.5	40.5	60 05.4	56.0	148 37.8	125	17 23.0	−104
8	292 23.5	287 18.5	52.2	35 45.4	24.2	215 14.7	40.6	75 08.0	55.9	163 09.3	125	17 12.6	−105
9	307 25.9	302 18.1	·· 53.5	50 46.5	·· 24.4	230 16.9	·· 40.6	90 10.6	·· 55.9	177 40.8	126	·17 02.1	−106
10	322 28.4	317 17.8	54.8	65 47.7	24.5	245 19.1	40.6	105 13.1	55.8	192 12.4	127	16 51.5	−106
11	337 30.9	332 17.4	56.1	80 48.9	24.7	260 21.3	40.7	120 15.7	55.8	206 44.1	128	16 40.9	−107
12	352 33.3	347 17.0	+ 0 57.3	95 50.0	−22 24.8	275 23.5	+22 40.7	135 18.3	−11 55.8	221 15.9	129	+16 30.2	−108
13	7 35.8	2 16.7	58.6	110 51.2	25.0	290 25.7	40.7	150 20.8	55.7	235 47.8	129	16 19.4	−109
14	22 38.3	17 16.3	0 59.9	125 52.3	25.1	305 27.9	40.7	165 23.4	55.7	250 19.7	130	16 08.5	−109
15	37 40.7	32 15.9	· 1 01.2	140 53.5	·· 25.3	320 30.0	·· 40.8	180 26.0	·· 55.6	264 51.7	131	·15 57.6	−109
16	52 43.2	47 15.5	02.5	155 54.6	25.5	335 32.2	40.8	195 28.5	55.6	279 23.8	132	15 46.7	−111
17	67 45.7	62 15.2	03.7	170 55.8	25.6	350 34.4	40.8	210 31.1	55.5	293 56.0	132	15 35.6	−111
18	82 48.1	77 14.8	+ 1 05.0	185 57.0	−22 25.8	5 36.6	+22 40.9	225 33.7	−11 55.5	308 28.2	133	+15 24.5	−111
19	97 50.6	92 14.4	06.3	200 58.1	25.9	20 38.8	40.9	240 36.2	55.5	323 00.5	134	15 13.4	−112
20	112 53.1	107 14.1	07.6	215 59.3	26.1	35 41.0	40.9	255 38.8	55.4	337 32.9	134	15 02.2	−113
21	127 55.5	122 13.7	·· 08.9	231 00.4	·· 26.2	50 43.2	·· 41.0	270 41.3	·· 55.4	352 05.3	136	·14 50.9	−113
22	142 58.0	137 13.3	10.2	246 01.6	26.4	65 45.4	41.0	285 43.9	55.3	6 37.9	136	14 39.6	−114
23	158 00.4	152 13.0	11.4	261 02.8	26.5	80 47.5	41.0	300 46.5	55.3	21 10.5	136	14 28.2	−115
16 0	173 02.9	167 12.6	+ 1 12.7	276 03.9	−22 26.7	95 49.7	+22 41.0	315 49.1	−11 55.3	35 43.1	138	+14 16.7	−114
1	188 05.4	182 12.2	14.0	291 05.1	26.8	110 51.9	41.1	330 51.6	55.2	50 15.9	138	14 05.3	−116
2	203 07.8	197 11.9	15.3	306 06.2	27.0	125 54.1	41.1	345 54.2	55.2	64 48.7	138	13 53.7	−116
3	218 10.3	212 11.5	·· 16.6	321 07.4	·· 27.2	140 56.3	·· 41.1	0 56.8	·· 55.1	79 21.5	140	·13 42.1	−116
4	233 12.8	227 11.1	17.8	336 08.6	27.3	155 58.5	41.2	15 59.3	55.1	93 54.5	140	13 30.5	−117
5	248 15.2	242 10.8	19.1	351 09.7	27.5	171 00.6	41.2	31 01.9	55.0	108 27.5	140	13 18.8	−118
6	263 17.7	257 10.4	+ 1 20.4	6 10.9	−22 27.6	186 02.8	+22 41.2	46 04.5	−11 55.0	123 00.5	141	+13 07.0	−118
7	278 20.2	272 10.0	21.7	21 12.1	27.8	201 05.0	41.2	61 07.0	55.0	137 33.6	142	12 55.2	−118
8	293 22.6	287 09.7	23.0	36 13.2	27.9	216 07.2	41.3	76 09.6	54.9	152 06.8	143	12 43.4	−119
9	308 25.1	302 09.3	·· 24.2	51 14.4	·· 28.1	231 09.4	·· 41.3	91 12.2	·· 54.9	166 40.1	143	·12 31.5	−120
10	323 27.5	317 08.9	25.5	66 15.5	28.2	246 11.6	41.3	106 14.7	54.8	181 13.4	144	12 19.5	−119
11	338 30.0	332 08.5	26.8	81 16.7	28.4	261 13.7	41.4	121 17.3	54.8	195 46.8	144	12 07.6	−121
12	353 32.5	347 08.2	+ 1 28.1	96 17.9	−22 28.5	276 15.9	+22 41.4	136 19.9	−11 54.8	210 20.2	145	+11 55.5	−120
13	8 34.9	2 07.8	29.4	111 19.0	28.7	291 18.1	41.4	151 22.4	54.7	224 53.7	146	11 43.5	−121
14	23 37.4	17 07.4	30.6	126 20.2	28.8	306 20.3	41.5	166 25.0	54.7	239 27.3	146	11 31.4	−122
15	38 39.9	32 07.1	·· 31.9	141 21.4	·· 29.0	321 22.5	·· 41.5	181 27.6	·· 54.6	254 00.9	147	·11 19.2	−122
16	53 42.3	47 06.7	33.2	156 22.5	29.1	336 24.7	41.5	196 30.1	54.6	268 34.6	147	11 07.0	−122
17	68 44.8	62 06.3	34.5	171 23.7	29.3	351 26.8	41.5	211 32.7	54.5	283 08.3	148	10 54.8	−123
18	83 47.3	77 06.0	+ 1 35.8	186 24.9	−22 29.4	6 29.0	+22 41.6	226 35.3	−11 54.5	297 42.1	148	+10 42.5	−123
19	98 49.7	92 05.6	37.1	201 26.0	29.6	21 31.2	41.6	241 37.8	54.5	312 15.9	149	10 30.2	−123
20	113 52.2	107 05.2	38.3	216 27.2	29.8	36 33.4	41.6	256 40.4	54.4	326 49.8	149	10 17.9	−124
21	128 54.7	122 04.9	·· 39.6	231 28.4	·· 29.9	51 35.6	·· 41.7	271 43.0	·· 54.4	341 23.7	150	·10 05.5	−124
22	143 57.1	137 04.5	40.9	246 29.5	30.1	66 37.7	41.7	286 45.6	54.3	355 57.7	150	9 53.1	−124
23	158 59.6	152 04.1	42.2	261 30.7	30.2	81 39.9	41.7	301 48.1	54.3	10 31.7	151	9 40.7	−125
24	174 02.0	167 03.8	+ 1 43.5	276 31.9	−22 30.4	96 42.1	+22 41.7	316 50.7	−11 54.2	25 05.8	152	+ 9 28.2	−125
code	—	−3	+13	+12	−2	+22	0	+25	+1				

G M T	SUN GHA	SUN Dec.
h	° ′	° ′
14 0	177 37.2	− 2 49.7
1	192 37.4	48.7
2	207 37.5	47.7
3	222 37.7	·· 46.7
4	237 37.9	45.8
5	252 38.0	44.8
6	267 38.2	− 2 43.8
7	282 38.4	42.8
8	297 38.6	41.8
9	312 38.7	·· 40.8
10	327 38.9	39.8
11	342 39.1	38.9
12	357 39.3	− 2 37.9
13	12 39.4	36.9
14	27 39.6	35.9
15	42 39.8	·· 34.9
16	57 40.0	33.9
17	72 40.1	32.9
18	87 40.3	− 2 32.0
19	102 40.5	31.0
20	117 40.6	30.0
21	132 40.8	·· 29.0
22	147 41.0	28.0
23	162 41.2	27.0
15 0	177 41.4	− 2 26.0
1	192 41.5	25.1
2	207 41.7	24.1
3	222 41.9	·· 23.1
4	237 42.1	22.1
5	252 42.2	21.1
6	267 42.4	− 2 20.1
7	282 42.6	19.1
8	297 42.8	18.2
9	312 42.9	·· 17.2
10	327 43.1	16.2
11	342 43.3	15.2
12	357 43.5	− 2 14.2
13	12 43.6	13.2
14	27 43.8	12.2
15	42 44.0	·· 11.3
16	57 44.2	10.3
17	72 44.3	09.3
18	87 44.5	− 2 08.3
19	102 44.7	07.3
20	117 44.9	06.3
21	132 45.1	·· 05.3
22	147 45.2	04.3
23	162 45.4	03.4
16 0	177 45.6	− 2 02.4
1	192 45.8	01.4
2	207 45.9	2 00.4
3	222 46.1	· 1 59.4
4	237 46.3	58.4
5	252 46.5	57.4
6	267 46.7	− 1 56.5
7	282 46.8	55.5
8	297 47.0	54.5
9	312 47.2	·· 53.5
10	327 47.4	52.5
11	342 47.6	51.5
12	357 47.7	− 1 50.5
13	12 47.9	49.5
14	27 48.1	48.6
15	42 48.3	·· 47.6
16	57 48.4	46.6
17	72 48.6	45.6
18	87 48.8	− 1 44.6
19	102 49.0	43.6
20	117 49.2	42.6
21	132 49.3	·· 41.6
22	147 49.5	40.7
23	162 49.7	39.7
24	177 49.9	− 1 38.7
code	—	+ 10

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 52.2	−40 29.4
5	Achernar	336 00.1	−57 28.2
30	Acrux	173 58.6	−62 50.9
19	Adhara	255 47.3	−28 54.7
10	Aldebaran	291 40.5	+16 25.2
32	Alioth	166 58.9	+56 12.2
34	Alkaid	153 33.3	+49 32.1
55	Al Na'ir	28 39.7	−47 11.0
15	Alnilam	276 31.4	− 1 13.8
25	Alphard	218 39.5	− 8 27.8
41	Alphecca	126 48.4	+26 51.7
1	Alpheratz	358 29.9	+28 50.3
51	Altair	62 51.7	+ 8 44.6
2	Ankaa	353 59.7	−42 33.3
42	Antares	113 20.7	−26 20.0
37	Arcturus	146 35.9	+19 24.9
43	Atria	109 02.4	−68 56.7
22	Avior	234 35.9	−59 22.0
13	Bellatrix	279 19.7	+ 6 18.6
16	Betelg'se	271 49.3	+ 7 24.0
17	Canopus	264 15.8	−52 40.5
12	Capella	281 40.2	+45 57.4
53	Deneb	50 02.2	+45 06.7
28	Denebola	183 18.5	+14 49.5
4	Diphda	349 40.7	−18 14.3
27	Dubhe	194 45.2	+61 59.8
14	Elnath	279 08.8	+28 34.4
47	Eltanin	91 06.8	+51 29.2
54	Enif	34 31.0	+ 9 39.7
56	Fomalhaut	16 13.2	−29 51.9
31	Gacrux	172 50.1	−56 51.5
29	Gienah	176 37.7	−17 17.5
35	Hadar	149 50.7	−60 09.2
6	Hamal	328 51.2	+23 14.9
48	Kaus Aust.	84 42.8	−34 24.5
40	Kochab	137 16.8	+74 20.2
57	Markab	14 22.9	+14 57.5
8	Menkar	315 01.7	+ 3 54.7
36	Menkent	148 59.8	−36 08.9
24	Miapl'dus	221 48.7	−69 32.0
9	Mirfak	309 44.4	+49 42.2
50	Nunki	76 53.4	−26 21.4
52	Peacock	54 29.4	−56 52.9
21	Pollux	244 21.8	+28 08.3
20	Procyon	245 46.0	+ 5 20.5
46	R'alhague	96 47.7	+12 35.2
26	Regulus	208 30.4	+12 11.3
11	Rigel	281 54.8	− 8 15.3
38	Rigil Kent.	140 52.2	−60 38.9
44	Sabik	103 03.5	−15 40.3
3	Schedar	350 32.0	+56 17.3
45	Shaula	97 22.2	−37 04.3
18	Sirius	259 12.8	−16 39.3
33	Spica	159 17.8	−10 55.6
23	Suhail	223 24.9	−43 15.1
49	Vega	81 09.1	+38 44.1
39	Zub'g'bi	137 54.4	−15 51.3

Lat.	Sunrise	Twlt. begins	Moonrise 14	Moonrise 15	Moonrise 16	Moonrise 17
N °	h m	h m	h m	h m	h m	h m
72	6 27	2 10	▭	10 46	13 26	15 29
70	6 25	2 43	▭	11 37	13 46	15 38
68	6 23	3 07	9 49	12 09	14 02	15 46
66	6 22	3 24	10 37	12 32	14 15	15 52
64	6 20	3 38	11 07	12 50	14 26	15 57
62	6 19	3 50	11 30	13 05	14 35	16 01
60	6 18	3 58	11 48	13 17	14 43	16 05
58	6 18	4 06	12 03	13 28	14 50	16 09
56	6 17	4 13	12 16	13 37	14 56	16 12
54	6 16	4 20	12 27	13 45	15 01	16 14
52	6 16	4 24	12 37	13 52	15 06	16 17
50	6 15	4 28	12 46	13 59	15 10	16 19
45	6 14	4 37	13 05	14 13	15 19	16 24
40	6 13	4 44	13 20	14 24	15 27	16 28
35	6 12	4 49	13 32	14 34	15 34	16 31
30	6 11	4 52	13 43	14 42	15 39	16 34
20	6 09	4 57	14 02	14 57	15 49	16 40
10	6 07	4 58	14 19	15 10	15 58	16 44
0	6 06	4 57	14 34	15 22	16 06	16 49
10	6 04	4 54	14 49	15 34	16 15	16 53
20	6 02	4 48	15 05	15 46	16 23	16 57
30	6 00	4 39	15 24	16 01	16 33	17 03
35	5 59	4 33	15 35	16 09	16 39	17 06
40	5 57	4 24	15 47	16 18	16 45	17 09
45	5 55	4 14	16 02	16 29	16 52	17 13
50	5 53	3 59	16 19	16 43	17 01	17 18
52	5 52	3 53	16 28	16 49	17 05	17 20
54	5 51	3 45	16 37	16 55	17 10	17 22
56	5 49	3 35	16 47	17 03	17 15	17 25
58	5 48	3 25	16 59	17 11	17 20	17 27
60	5 46	3 12	17 13	17 21	17 27	17 30
S						

Lat.	Sunset	Twlt. ends	Moonset 14	Moonset 15	Moonset 16	Moonset 17
N °	h m	h m	h m	h m	h m	h m
72	17 54	22 21	▭	7 53	6 48	6 14
70	17 56	21 44	▭	7 01	6 25	6 02
68	17 57	21 19	7 06	6 28	6 08	5 53
66	17 58	21 00	6 18	6 03	5 53	5 45
64	17 59	20 45	5 46	5 44	5 41	5 38
62	18 00	20 34	5 23	5 28	5 31	5 32
60	18 01	20 24	5 04	5 15	5 22	5 27
58	18 02	20 16	4 48	5 04	5 14	5 22
56	18 02	20 08	4 35	4 54	5 08	5 18
54	18 03	20 03	4 23	4 45	5 01	5 15
52	18 04	19 58	4 13	4 37	4 56	5 11
50	18 04	19 53	4 03	4 30	4 51	5 08
45	18 05	19 43	3 44	4 15	4 40	5 02
40	18 06	19 36	3 28	4 02	4 31	4 56
35	18 07	19 31	3 14	3 51	4 23	4 51
30	18 08	19 28	3 03	3 42	4 16	4 47
20	18 10	19 23	2 42	3 25	4 04	4 40
10	18 11	19 21	2 24	3 11	3 53	4 33
0	18 12	19 21	2 08	2 57	3 43	4 27
10	18 14	19 24	1 51	2 44	3 33	4 21
20	18 16	19 29	1 33	2 29	3 23	4 14
30	18 18	19 38	1 12	2 12	3 10	4 06
35	18 19	19 44	1 00	2 02	3 03	4 02
40	18 20	19 52	0 45	1 51	2 55	3 57
45	18 22	20 02	0 28	1 37	2 45	3 51
50	18 24	20 15	0 08	1 21	2 33	3 43
52	18 25	20 22	25 13	1 13	2 27	3 40
54	18 26	20 29	25 04	1 04	2 21	3 36
56	18 28	20 39	24 55	0 55	2 15	3 32
58	18 29	20 49	24 43	0 43	2 07	3 28
60	18 30	21 00	24 30	0 30	1 58	3 23
S						

G M T	Equation of Time (App.—Mean) 14	15	16
h	m s	m s	m s
0	− 9 31.6	− 9 15.0	− 8 58.0
6	− 9 27.5	− 9 10.7	− 8 53.7
12	− 9 23.3	− 9 06.5	− 8 49.4
18	− 9 19.1	− 9 02.3	− 8 45.1
24	− 9 15.0	− 8 58.0	− 8 40.8

GMT of Transit
Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
14	20 46	12 50	5 39	17 41	3 04
15	21 33	12 51	5 37	17 38	3 00
16	22 17	12 52	5 35	17 34	2 56
17	22 59	12 52	5 33	17 31	2 52

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.4	0.1	0.1
30	0.4	0.1	0.1
45	0.4	0.1	0.1
60	0.4	0.0	0.0
75	0.4	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	14	15	16
°	′	′	′
0	14.5	13.8	13.3
4	14.5	13.8	13.3
8	14.5	13.8	13.3
12	14.6	13.8	13.3
16	14.6	13.8	13.3
20	14.6	13.9	13.4
24	14.6	13.9	13.4
28	14.6	14.0	13.5
32	14.7	14.0	13.6
36	14.7	14.1	13.6
40	14.7	14.1	13.7
44	14.8	14.2	13.8
48	14.8	14.3	13.9
52	14.9	14.3	14.0
56	14.9	14.4	14.1
60	15.0	14.5	14.2
64	15.0	14.6	14.3
68	15.1	14.7	14.4
72	15.1	14.8	14.6
76	15.2	14.9	14.7
80	15.2	15.0	14.8
84	15.3	15.1	14.9
88	15.3	15.1	15.0
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	14	15	16
°	′	′	′
0	16.1	16.6	16.9
4	16.1	16.6	16.8
8	16.1	16.5	16.8
12	16.1	16.5	16.8
16	16.1	16.5	16.8
20	16.1	16.5	16.7
24	16.1	16.4	16.7
28	16.0	16.4	16.6
32	16.0	16.3	16.6
36	16.0	16.3	16.5
40	15.9	16.2	16.4
44	15.9	16.1	16.3
48	15.8	16.1	16.2
52	15.8	16.0	16.1
56	15.8	15.9	16.0
60	15.7	15.8	15.9
64	15.7	15.7	15.8
68	15.6	15.6	15.7
72	15.6	15.6	15.6
76	15.5	15.5	15.4
80	15.4	15.4	15.3
84	15.4	15.3	15.2
88	15.3	15.2	15.1
90			

Subtract from table, back cover

Day	GMT	♈ GHA	VENUS −3.4 GHA	VENUS Dec.	MARS 0.5 GHA	MARS Dec.	JUPITER −1.8 GHA	JUPITER Dec.	SATURN 0.5 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
17	0	174 02.0	167 03.8	+ 1 43.5	276 31.9	−22 30.4	96 42.1	+22 41.7	316 50.7	−11 54.2	25 05.8	152	+ 9 28.2	−125
	1	189 04.5	182 03.4	44.7	291 33.0	30.5	111 44.3	41.8	331 53.3	54.2	39 40.0	152	9 15.7	−125
	2	204 07.0	197 03.0	46.0	306 34.2	30.7	126 46.4	41.8	346 55.8	54.2	54 14.2	152	9 03.2	−126
	3	219 09.4	212 02.7	·· 47.3	321 35.4	·· 30.8	141 48.6	·· 41.8	1 58.4	·· 54.1	68 48.4	153	· 8 50.6	−126
	4	234 11.9	227 02.3	48.6	336 36.5	31.0	156 50.8	41.9	17 01.0	54.1	83 22.7	153	8 38.0	−126
	5	249 14.4	242 01.9	49.9	351 37.7	31.1	171 53.0	41.9	32 03.6	54.0	97 57.0	154	8 25.4	−126
	6	264 16.8	257 01.6	+ 1 51.1	6 38.9	−22 31.3	186 55.2	+22 41.9	47 06.1	−11 54.0	112 31.4	154	+ 8 12.8	−127
	7	279 19.3	272 01.2	52.4	21 40.0	31.4	201 57.3	42.0	62 08.7	53.9	127 05.8	154	8 00.1	−127
	8	294 21.8	287 00.8	53.7	36 41.2	31.6	216 59.5	42.0	77 11.3	53.9	141 40.2	155	7 47.4	−127
	9	309 24.2	302 00.4	·· 55.0	51 42.4	·· 31.7	232 01.7	·· 42.0	92 13.8	·· 53.9	156 14.7	156	· 7 34.7	−128
	10	324 26.7	317 00.1	56.2	66 43.5	31.9	247 03.9	42.0	107 16.4	53.8	170 49.3	156	7 21.9	−127
	11	339 29.2	331 59.7	57.5	81 44.7	32.0	262 06.0	42.1	122 19.0	53.8	185 23.9	156	7 09.2	−128
	12	354 31.6	346 59.3	+ 1 58.8	96 45.9	−22 32.2	277 08.2	+22 42.1	137 21.5	−11 53.7	199 58.5	156	+ 6 56.4	−128
	13	9 34.1	1 59.0	2 00.1	111 47.1	32.3	292 10.4	42.1	152 24.1	53.7	214 33.1	157	6 43.6	−128
	14	24 36.5	16 58.6	01.4	126 48.2	32.5	307 12.6	42.2	167 26.7	53.6	229 07.8	158	6 30.8	−129
	15	39 39.0	31 58.2	·· 02.6	141 49.4	·· 32.6	322 14.7	·· 42.2	182 29.3	·· 53.6	243 42.6	157	· 6 17.9	−128
	16	54 41.5	46 57.9	03.9	156 50.6	32.7	337 16.9	42.2	197 31.8	53.5	258 17.3	158	6 05.1	−129
	17	69 43.9	61 57.5	05.2	171 51.7	32.9	352 19.1	42.3	212 34.4	53.5	272 52.1	159	5 52.2	−129
	18	84 46.4	76 57.1	+ 2 06.5	186 52.9	−22 33.0	7 21.3	+22 42.3	227 37.0	−11 53.5	287 27.0	158	+ 5 39.3	−129
	19	99 48.9	91 56.8	07.8	201 54.1	33.2	22 23.4	42.3	242 39.6	53.4	302 01.8	159	5 26.4	−130
	20	114 51.3	106 56.4	09.0	216 55.3	33.3	37 25.6	42.3	257 42.1	53.4	316 36.7	160	5 13.4	−129
	21	129 53.8	121 56.0	·· 10.3	231 56.4	·· 33.5	52 27.8	·· 42.4	272 44.7	·· 53.3	331 11.7	159	· 5 00.5	−130
	22	144 56.3	136 55.7	11.6	246 57.6	33.6	67 29.9	42.4	287 47.3	53.3	345 46.6	160	4 47.5	−129
	23	159 58.7	151 55.3	12.9	261 58.8	33.8	82 32.1	42.4	302 49.9	53.2	0 21.6	160	4 34.6	−130
18	0	175 01.2	166 54.9	+ 2 14.2	277 00.0	−22 33.9	97 34.3	+22 42.5	317 52.4	−11 53.2	14 56.6	161	+ 4 21.6	−130
	1	190 03.6	181 54.5	15.4	292 01.1	34.1	112 36.5	42.5	332 55.0	53.2	29 31.7	160	4 08.6	−130
	2	205 06.1	196 54.2	16.7	307 02.3	34.2	127 38.6	42.5	347 57.6	53.1	44 06.7	161	3 55.6	−130
	3	220 08.6	211 53.8	·· 18.0	322 03.5	·· 34.4	142 40.8	·· 42.6	3 00.1	·· 53.1	58 41.8	162	· 3 42.6	−130
	4	235 11.0	226 53.4	19.3	337 04.7	34.5	157 43.0	42.6	18 02.7	53.0	73 17.0	161	3 29.6	−130
	5	250 13.5	241 53.1	20.6	352 05.8	34.7	172 45.1	42.6	33 05.3	53.0	87 52.1	162	3 16.6	−131
	6	265 16.0	256 52.7	+ 2 21.8	7 07.0	−22 34.8	187 47.3	+22 42.6	48 07.9	−11 52.9	102 27.3	162	+ 3 03.5	−130
	7	280 18.4	271 52.3	23.1	22 08.2	34.9	202 49.5	42.7	63 10.4	52.9	117 02.5	162	2 50.5	−130
	8	295 20.9	286 52.0	24.4	37 09.4	35.1	217 51.6	42.7	78 13.0	52.8	131 37.7	162	2 37.5	−131
	9	310 23.4	301 51.6	·· 25.7	52 10.5	·· 35.2	232 53.8	·· 42.7	93 15.6	·· 52.8	146 12.9	163	· 2 24.4	−130
	10	325 25.8	316 51.2	26.9	67 11.7	35.4	247 56.0	42.8	108 18.2	52.8	160 48.2	162	2 11.4	−131
	11	340 28.3	331 50.9	28.2	82 12.9	35.5	262 58.2	42.8	123 20.7	52.7	175 23.4	163	1 58.3	−130
	12	355 30.8	346 50.5	+ 2 29.5	97 14.1	−22 35.7	278 00.3	+22 42.8	138 23.3	−11 52.7	189 58.7	163	+ 1 45.3	−131
	13	10 33.2	1 50.1	30.8	112 15.3	35.8	293 02.5	42.9	153 25.9	52.6	204 34.0	163	1 32.2	−130
	14	25 35.7	16 49.8	32.1	127 16.4	36.0	308 04.7	42.9	168 28.5	52.6	219 09.3	164	1 19.2	−131
	15	40 38.1	31 49.4	·· 33.3	142 17.6	·· 36.1	323 06.8	·· 42.9	183 31.0	·· 52.5	233 44.7	163	· 1 06.1	−130
	16	55 40.6	46 49.0	34.6	157 18.8	36.3	338 09.0	42.9	198 33.6	52.5	248 20.0	164	0 53.1	−131
	17	70 43.1	61 48.6	35.9	172 20.0	36.4	353 11.2	43.0	213 36.2	52.4	262 55.4	164	0 40.0	−130
	18	85 45.5	76 48.3	+ 2 37.2	187 21.2	−22 36.5	8 13.3	+22 43.0	228 38.8	−11 52.4	277 30.8	163	+ 0 27.0	−131
	19	100 48.0	91 47.9	38.4	202 22.3	36.7	23 15.5	43.0	243 41.4	52.4	292 06.1	164	0 13.9	−130
	20	115 50.5	106 47.5	39.7	217 23.5	36.8	38 17.7	43.1	258 43.9	52.3	306 41.5	164	+ 0 00.9	−131
	21	130 52.9	121 47.2	·· 41.0	232 24.7	·· 37.0	53 19.8	·· 43.1	273 46.5	·· 52.3	321 16.9	165	− 0 12.2	−130
	22	145 55.4	136 46.8	42.3	247 25.9	37.1	68 22.0	43.1	288 49.1	52.2	335 52.4	164	0 25.2	−130
	23	160 57.9	151 46.4	43.6	262 27.1	37.3	83 24.2	43.2	303 51.7	52.2	350 27.8	164	0 38.2	−130
19	0	176 00.3	166 46.1	+ 2 44.8	277 28.2	−22 37.4	98 26.3	+22 43.2	318 54.2	−11 52.1	5 03.2	164	− 0 51.2	−130
	1	191 02.8	181 45.7	46.1	292 29.4	37.5	113 28.5	43.2	333 56.8	52.1	19 38.6	165	1 04.2	−130
	2	206 05.2	196 45.3	47.4	307 30.6	37.7	128 30.6	43.2	348 59.4	52.0	34 14.1	164	1 17.2	−130
	3	221 07.7	211 44.9	·· 48.7	322 31.8	·· 37.8	143 32.8	·· 43.3	4 02.0	·· 52.0	48 49.5	165	· 1 30.2	−130
	4	236 10.2	226 44.6	49.9	337 33.0	38.0	158 35.0	43.3	19 04.5	52.0	63 25.0	164	1 43.2	−130
	5	251 12.6	241 44.2	51.2	352 34.2	38.1	173 37.1	43.3	34 07.1	51.9	78 00.4	165	1 56.2	−129
	6	266 15.1	256 43.8	+ 2 52.5	7 35.3	−22 38.3	188 39.3	+22 43.4	49 09.7	−11 51.9	92 35.9	164	− 2 09.1	−130
	7	281 17.6	271 43.5	53.8	22 36.5	38.4	203 41.5	43.4	64 12.3	51.8	107 11.3	165	2 22.1	−129
	8	296 20.0	286 43.1	55.0	37 37.7	38.5	218 43.6	43.4	79 14.9	51.8	121 46.8	164	2 35.0	−129
	9	311 22.5	301 42.7	·· 56.3	52 38.9	·· 38.7	233 45.8	·· 43.5	94 17.4	·· 51.7	136 22.2	165	· 2 47.9	−129
	10	326 25.0	316 42.4	57.6	67 40.1	38.8	248 47.9	43.5	109 20.0	51.7	150 57.7	164	3 00.8	−129
	11	341 27.4	331 42.0	2 58.9	82 41.3	39.0	263 50.1	43.5	124 22.6	51.6	165 33.1	165	3 13.7	−129
	12	356 29.9	346 41.6	+ 3 00.1	97 42.4	−22 39.1	278 52.3	+22 43.5	139 25.2	−11 51.6	180 08.6	164	− 3 26.6	−128
	13	11 32.4	1 41.2	01.4	112 43.6	39.2	293 54.4	43.6	154 27.7	51.5	194 44.0	165	3 39.4	−129
	14	26 34.8	16 40.9	02.7	127 44.8	39.4	308 56.6	43.6	169 30.3	51.5	209 19.5	164	3 52.3	−128
	15	41 37.3	31 40.5	·· 04.0	142 46.0	·· 39.5	323 58.7	·· 43.6	184 32.9	·· 51.5	223 54.9	164	· 4 05.1	−128
	16	56 39.7	46 40.1	05.2	157 47.2	39.7	339 00.9	43.7	199 35.5	51.4	238 30.3	164	4 17.9	−127
	17	71 42.2	61 39.8	06.5	172 48.4	39.8	354 03.1	43.7	214 38.1	51.4	253 05.7	164	4 30.6	−128
	18	86 44.7	76 39.4	+ 3 07.8	187 49.6	−22 39.9	9 05.2	+22 43.7	229 40.6	−11 51.3	267 41.1	164	− 4 43.4	−127
	19	101 47.1	91 39.0	09.1	202 50.8	40.1	24 07.4	43.8	244 43.2	51.3	282 16.5	164	4 56.1	−127
	20	116 49.6	106 38.7	10.3	217 51.9	40.2	39 09.5	43.8	259 45.8	51.2	296 51.9	164	5 08.8	−127
	21	131 52.1	121 38.3	·· 11.6	232 53.1	·· 40.4	54 11.7	·· 43.8	274 48.4	·· 51.2	311 27.3	164	· 5 21.5	−127
	22	146 54.5	136 37.9	12.9	247 54.3	40.5	69 13.9	43.9	289 51.0	51.1	326 02.7	163	5 34.2	−126
	23	161 57.0	151 37.5	14.2	262 55.5	40.6	84 16.0	43.9	304 53.5	51.1	340 38.0	164	5 46.8	−127
	24	176 59.5	166 37.2	+ 3 15.4	277 56.7	−22 40.8	99 18.2	+22 43.9	319 56.1	−11 51.0	355 13.4	163	− 5 59.5	−125
	code	—	− 4	+ 13	+ 12	− 1	+ 22	+ 1	+ 26	+ 1				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
17 0	177 49.9	− 1 38.7
1	192 50.1	37.7
2	207 50.2	36.7
3	222 50.4	35.7
4	237 50.6	34.7
5	252 50.8	33.7
6	267 51.0	− 1 32.8
7	282 51.2	31.8
8	297 51.3	30.8
9	312 51.5	29.8
10	327 51.7	28.8
11	342 51.9	27.8
12	357 52.1	− 1 26.8
13	12 52.2	25.8
14	27 52.4	24.9
15	42 52.6	23.9
16	57 52.8	22.9
17	72 53.0	21.9
18	87 53.1	− 1 20.9
19	102 53.3	19.9
20	117 53.5	18.9
21	132 53.7	17.9
22	147 53.9	17.0
23	162 54.1	16.0
18 0	177 54.2	− 1 15.0
1	192 54.4	14.0
2	207 54.6	13.0
3	222 54.8	12.0
4	237 55.0	11.0
5	252 55.2	10.0
6	267 55.3	− 1 09.0
7	282 55.5	08.1
8	297 55.7	07.1
9	312 55.9	06.1
10	327 56.1	05.1
11	342 56.3	04.1
12	357 56.4	− 1 03.1
13	12 56.6	02.1
14	27 56.8	01.1
15	42 57.0	· 1 00.2
16	57 57.2	0 59.2
17	72 57.4	58.2
18	87 57.5	− 0 57.2
19	102 57.7	56.2
20	117 57.9	55.2
21	132 58.1	54.2
22	147 58.3	53.2
23	162 58.5	52.3
19 0	177 58.6	− 0 51.3
1	192 58.8	50.3
2	207 59.0	49.3
3	222 59.2	48.3
4	237 59.4	47.3
5	252 59.6	46.3
6	267 59.7	− 0 45.3
7	282 59.9	44.4
8	298 00.1	43.4
9	313 00.3	42.4
10	328 00.5	41.4
11	343 00.7	40.4
12	358 00.9	− 0 39.4
13	13 01.0	38.4
14	28 01.2	37.4
15	43 01.4	36.4
16	58 01.6	35.5
17	73 01.8	34.5
18	88 02.0	− 0 33.5
19	103 02.2	32.5
20	118 02.3	31.5
21	133 02.5	30.5
22	148 02.7	29.5
23	163 02.9	28.5
24	178 03.1	− 0 27.6
code	—	+ 10

No.	STARS Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 52.2	−40 29.4
5	Achernar	336 00.1	−57 28.2
30	Acrux	173 58.6	−62 50.9
19	Adhara	255 47.3	−28 54.7
10	Aldebaran	291 40.5	+16 25.2
32	Alioth	166 58.9	+56 12.2
34	Alkaid	153 33.3	+49 32.2
55	Al Na'ir	28 39.7	−47 10.9
15	Alnilam	276 31.5	− 1 13.8
25	Alphard	218 39.5	− 8 27.8
41	Alphecca	126 48.4	+26 51.7
1	Alpheratz	358 29.9	+28 50.3
51	Altair	62 51.7	+ 8 44.6
2	Ankaa	353 59.7	−42 33.3
42	Antares	113 20.7	−26 20.0
37	Arcturus	146 35.9	+19 24.9
43	Atria	109 02.3	−68 56.7
22	Avior	234 36.0	−59 22.0
13	Bellatrix	279 19.7	+ 6 18.6
16	Betelg'se	271 49.4	+ 7 24.0
17	Canopus	264 15.8	−52 40.5
12	Capella	281 40.2	+45 57.4
53	Deneb	50 02.1	+45 06.7
28	Denebola	183 18.5	+14 49.5
4	Diphda	349 40.7	−18 14.3
27	Dubhe	194 45.2	+61 59.8
14	Elnath	279 08.8	+28 34.3
47	Eltanin	91 06.8	+51 29.2
54	Enif	34 31.0	+ 9 39.7
56	Fomalhaut	16 13.2	−29 51.9
31	Gacrux	172 50.1	−56 51.6
29	Gienah	176 37.7	−17 17.5
35	Hadar	149 50.6	−60 09.2
6	Hamal	328 51.2	+23 14.9
48	Kaus Aust.	84 42.7	−34 24.5
40	Kochab	137 16.8	+74 20.2
57	Markab	14 22.9	+14 57.5
8	Menkar	315 01.7	+ 3 54.7
36	Menkent	148 59.7	−36 08.9
24	Miapl'dus	221 48.8	−69 32.0
9	Mirfak	309 44.4	+49 42.2
50	Nunki	76 53.4	−26 21.4
52	Peacock	54 29.4	−56 52.9
21	Pollux	244 21.8	+28 08.3
20	Procyon	245 46.0	+ 5 20.5
46	R'alhague	96 47.6	+12 35.2
26	Regulus	208 30.4	+12 11.3
11	Rigel	281 54.8	− 8 15.3
38	Rigil Kent.	140 52.2	−60 38.9
44	Sabik	103 03.4	−15 40.3
3	Schedar	350 32.0	+56 17.3
45	Shaula	97 22.2	−37 04.3
18	Sirius	259 12.8	−16 39.3
33	Spica	159 17.8	−10 55.6
23	Suhail	223 24.9	−43 15.1
49	Vega	81 09.1	+38 44.1
39	Zub'g'bi	137 54.4	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 17	18	19	20
N °	h m	h m	h m	h m	h m	h m
72	6 11	1 34	15 29	17 23	19 15	21 12
70	6 11	2 20	15 38	17 24	19 08	20 55
68	6 10	2 49	15 46	17 24	19 01	20 41
66	6 10	3 09	15 52	17 25	18 56	20 29
64	6 10	3 25	15 57	17 25	18 52	20 20
62	6 10	3 38	16 01	17 26	18 49	20 12
60	6 09	3 48	16 05	17 26	18 45	20 05
58	6 09	3 57	16 09	17 26	18 43	19 59
56	6 09	4 05	16 12	17 26	18 40	19 54
54	6 09	4 11	16 14	17 27	18 38	19 49
52	6 09	4 17	16 17	17 27	18 36	19 45
50	6 08	4 22	16 19	17 27	18 34	19 41
45	6 08	4 32	16 24	17 27	18 30	19 33
40	6 08	4 38	16 28	17 28	18 27	19 26
35	6 07	4 45	16 31	17 28	18 24	19 20
30	6 07	4 48	16 34	17 28	18 21	19 15
20	6 06	4 54	16 40	17 29	18 17	19 06
10	6 06	4 56	16 44	17 29	18 13	18 58
0	6 05	4 56	16 49	17 30	18 10	18 51
10	6 04	4 54	16 53	17 30	18 06	18 44
20	6 03	4 50	16 57	17 30	18 03	18 36
30	6 02	4 41	17 03	17 31	17 59	18 27
35	6 01	4 35	17 06	17 31	17 56	18 22
40	6 00	4 28	17 09	17 32	17 54	18 17
45	5 59	4 19	17 13	17 32	17 51	18 10
50	5 57	4 05	17 18	17 32	17 47	18 03
52	5 57	3 59	17 20	17 33	17 45	17 59
54	5 56	3 52	17 22	17 33	17 44	17 55
56	5 55	3 43	17 25	17 33	17 42	17 51
58	5 54	3 34	17 27	17 33	17 40	17 46
60	5 53	3 22	17 30	17 34	17 37	17 41
S						

Lat.	Sunset	Twlt. ends	Moonset 17	18	19	20
N °	h m	h m	h m	h m	h m	h m
72	18 08	22 59	6 14	5 47	5 22	4 57
70	18 08	22 07	6 02	5 43	5 25	5 07
68	18 08	21 36	5 53	5 40	5 28	5 15
66	18 08	21 14	5 45	5 37	5 29	5 22
64	18 08	20 57	5 38	5 35	5 31	5 28
62	18 08	20 44	5 32	5 32	5 33	5 33
60	18 09	20 34	5 27	5 31	5 34	5 37
58	18 09	20 24	5 22	5 29	5 35	5 41
56	18 09	20 16	5 18	5 27	5 36	5 45
54	18 09	20 10	5 15	5 26	5 37	5 48
52	18 09	20 04	5 11	5 25	5 38	5 51
50	18 09	19 58	5 08	5 24	5 39	5 53
45	18 09	19 48	5 02	5 21	5 40	5 59
40	18 09	19 40	4 56	5 19	5 42	6 04
35	18 10	19 34	4 51	5 18	5 43	6 08
30	18 10	19 30	4 47	5 16	5 44	6 12
20	18 10	19 23	4 40	5 13	5 46	6 18
10	18 11	19 21	4 33	5 11	5 47	6 24
0	18 11	19 20	4 27	5 08	5 49	6 29
10	18 12	19 22	4 21	5 06	5 51	6 35
20	18 13	19 26	4 14	5 03	5 52	6 41
30	18 14	19 34	4 06	5 00	5 54	6 47
35	18 15	19 40	4 02	4 59	5 55	6 51
40	18 16	19 47	3 57	4 57	5 56	6 55
45	18 17	19 56	3 51	4 55	5 58	7 00
50	18 18	20 08	3 43	4 52	5 59	7 06
52	18 19	20 15	3 40	4 51	6 00	7 09
54	18 19	20 21	3 36	4 49	6 01	7 12
56	18 20	20 29	3 32	4 48	6 02	7 15
58	18 21	20 39	3 28	4 46	6 03	7 19
60	18 22	20 50	3 23	4 44	6 04	7 23
S						

GMT	Equation of Time (App.—Mean) 17	18	19
h	m s	m s	m s
0	− 8 40.8	− 8 23.4	− 8 05.8
6	− 8 36.5	− 8 19.0	− 8 01.4
12	− 8 32.1	− 8 14.6	− 7 57.0
18	− 8 27.8	− 8 10.2	− 7 52.5
24	− 8 23.4	− 8 05.8	− 7 48.1

GMT of Transit
Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
17	22 59	12 52	5 33	17 31	2 52
18	23 39	12 53	5 32	17 27	2 48
19	24 20	12 53	5 30	17 24	2 44
20	0 20	12 54	5 28	17 20	2 40

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.4	0.1	0.1
30			
	0.4	0.1	0.1
45			
	0.4	0.1	0.1
60			
	0.4	0.0	0.1
75			
	0.4	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	17	18	19
°	′	′	′
0			
	12.8	12.4	12.0
4			
	12.8	12.4	12.0
8			
	12.8	12.4	12.0
12			
	12.8	12.4	12.1
16			
	12.9	12.5	12.1
20			
	12.9	12.6	12.2
24			
	13.0	12.6	12.3
28			
	13.0	12.7	12.4
32			
	13.1	12.8	12.5
36			
	13.2	12.9	12.6
40			
	13.3	13.0	12.7
44			
	13.4	13.1	12.8
48			
	13.5	13.3	13.0
52			
	13.7	13.4	13.1
56			
	13.8	13.5	13.3
60			
	13.9	13.7	13.5
64			
	14.1	13.9	13.6
68			
	14.2	14.0	13.8
72			
	14.3	14.2	14.0
76			
	14.5	14.4	14.2
80			
	14.6	14.5	14.4
84			
	14.8	14.7	14.6
88			
	14.9	14.8	14.7
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	17	18	19
°	′	′	′
0			
	17.2	17.4	17.6
4			
	17.1	17.4	17.6
8			
	17.1	17.3	17.5
12			
	17.1	17.3	17.5
16			
	17.0	17.2	17.5
20			
	17.0	17.2	17.4
24			
	16.9	17.1	17.3
28			
	16.9	17.0	17.2
32			
	16.8	16.9	17.1
36			
	16.7	16.8	17.0
40			
	16.6	16.7	16.9
44			
	16.5	16.6	16.7
48			
	16.4	16.5	16.6
52			
	16.2	16.3	16.4
56			
	16.1	16.2	16.3
60			
	16.0	16.0	16.1
64			
	15.8	15.9	15.9
68			
	15.7	15.7	15.7
72			
	15.6	15.6	15.6
76			
	15.4	15.4	15.4
80			
	15.3	15.2	15.2
84			
	15.1	15.0	15.0
88			
	15.0	14.9	14.8
90			

Subtract from table, back cover

Full Moon 19

GMT	♈ GHA	VENUS −3.4 GHA	VENUS Dec.	MARS 0.4 GHA	MARS Dec.	JUPITER −1.8 GHA	JUPITER Dec.	SATURN 0.5 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
20 0	176 59.5	166 37.2	+ 3 15.4	277 56.7	−22 40.8	99 18.2	+22 43.9	319 56.1	−11 51.0	355 13.4	163	− 5 59.5	−125
1	192 01.9	181 36.8	16.7	292 57.9	40.9	114 20.3	43.9	334 58.7	51.0	9 48.7	163	6 12.0	−126
2	207 04.4	196 36.4	18.0	307 59.1	41.1	129 22.5	44.0	350 01.3	51.0	24 24.0	163	6 24.6	−125
3	222 06.8	211 36.1	·· 19.3	323 00.3	·· 41.2	144 24.6	·· 44.0	5 03.9	·· 50.9	38 59.3	163	· 6 37.1	−125
4	237 09.3	226 35.7	20.5	338 01.5	41.3	159 26.8	44.0	20 06.4	50.9	53 34.6	163	6 49.6	−125
5	252 11.8	241 35.3	21.8	353 02.6	41.5	174 29.0	44.1	35 09.0	50.8	68 09.9	162	7 02.1	−125
6	267 14.2	256 34.9	+ 3 23.1	8 03.8	−22 41.6	189 31.1	+22 44.1	50 11.6	−11 50.8	82 45.1	162	− 7 14.6	−124
7	282 16.7	271 34.6	24.4	23 05.0	41.8	204 33.3	44.1	65 14.2	50.7	97 20.3	163	7 27.0	−124
8	297 19.2	286 34.2	25.6	38 06.2	41.9	219 35.4	44.2	80 16.8	50.7	111 55.6	161	7 39.4	−123
9	312 21.6	301 33.8	·· 26.9	53 07.4	·· 42.0	234 37.6	·· 44.2	95 19.3	·· 50.6	126 30.7	162	· 7 51.7	−124
10	327 24.1	316 33.5	28.2	68 08.6	42.2	249 39.7	44.2	110 21.9	50.6	141 05.9	162	8 04.1	−123
11	342 26.6	331 33.1	29.5	83 09.8	42.3	264 41.9	44.2	125 24.5	50.5	155 41.1	161	8 16.4	−122
12	357 29.0	346 32.7	+ 3 30.7	98 11.0	−22 42.4	279 44.0	+22 44.3	140 27.1	−11 50.5	170 16.2	161	− 8 28.6	−122
13	12 31.5	1 32.3	32.0	113 12.2	42.6	294 46.2	44.3	155 29.7	50.4	184 51.3	161	8 40.8	−122
14	27 34.0	16 32.0	33.3	128 13.4	42.7	309 48.4	44.3	170 32.3	50.4	199 26.4	160	8 53.0	−122
15	42 36.4	31 31.6	·· 34.5	143 14.6	·· 42.9	324 50.5	·· 44.4	185 34.8	·· 50.4	214 01.4	160	· 9 05.2	−121
16	57 38.9	46 31.2	35.8	158 15.8	43.0	339 52.7	44.4	200 37.4	50.3	228 36.4	160	9 17.3	−121
17	72 41.3	61 30.9	37.1	173 17.0	43.1	354 54.8	44.4	215 40.0	50.3	243 11.4	160	9 29.4	−120
18	87 43.8	76 30.5	+ 3 38.4	188 18.2	−22 43.3	9 57.0	+22 44.5	230 42.6	−11 50.2	257 46.4	159	− 9 41.4	−120
19	102 46.3	91 30.1	39.6	203 19.4	43.4	24 59.1	44.5	245 45.2	50.2	272 21.3	160	9 53.4	−119
20	117 48.7	106 29.7	40.9	218 20.6	43.5	40 01.3	44.5	260 47.8	50.1	286 56.3	158	10 05.3	−120
21	132 51.2	121 29.4	·· 42.2	233 21.7	·· 43.7	55 03.4	·· 44.6	275 50.3	·· 50.1	301 31.1	159	·10 17.3	−118
22	147 53.7	136 29.0	43.4	248 22.9	43.8	70 05.6	44.6	290 52.9	50.0	316 06.0	158	10 29.1	−119
23	162 56.1	151 28.6	44.7	263 24.1	43.9	85 07.7	44.6	305 55.5	50.0	330 40.8	158	10 41.0	−118
21 0	177 58.6	166 28.2	+ 3 46.0	278 25.3	−22 44.1	100 09.9	+22 44.6	320 58.1	−11 49.9	345 15.6	158	−10 52.8	−117
1	193 01.1	181 27.9	47.3	293 26.5	44.2	115 12.0	44.7	336 00.7	49.9	359 50.4	157	11 04.5	−117
2	208 03.5	196 27.5	48.5	308 27.7	44.4	130 14.2	44.7	351 03.3	49.8	14 25.1	157	11 16.2	−117
3	223 06.0	211 27.1	·· 49.8	323 28.9	·· 44.5	145 16.3	·· 44.7	6 05.8	·· 49.8	28 59.8	157	·11 27.9	−116
4	238 08.5	226 26.8	51.1	338 30.1	44.6	160 18.5	44.8	21 08.4	49.7	43 34.5	156	11 39.5	−115
5	253 10.9	241 26.4	52.3	353 31.3	44.8	175 20.6	44.8	36 11.0	49.7	58 09.1	156	11 51.0	−116
6	268 13.4	256 26.0	+ 3 53.6	8 32.5	−22 44.9	190 22.8	+22 44.8	51 13.6	−11 49.7	72 43.7	155	−12 02.6	−114
7	283 15.8	271 25.6	54.9	23 33.7	45.0	205 24.9	44.9	66 16.2	49.6	87 18.2	155	12 14.0	−115
8	298 18.3	286 25.3	56.2	38 34.9	45.2	220 27.1	44.9	81 18.8	49.6	101 52.7	155	12 25.5	−113
9	313 20.8	301 24.9	·· 57.4	53 36.1	·· 45.3	235 29.2	·· 44.9	96 21.3	·· 49.5	116 27.2	155	·12 36.8	−113
10	328 23.2	316 24.5	3 58.7	68 37.3	45.4	250 31.4	45.0	111 23.9	49.5	131 01.7	154	12 48.1	−113
11	343 25.7	331 24.1	4 00.0	83 38.5	45.6	265 33.5	45.0	126 26.5	49.4	145 36.1	153	12 59.4	−112
12	358 28.2	346 23.8	+ 4 01.2	98 39.7	−22 45.7	280 35.7	+22 45.0	141 29.1	−11 49.4	160 10.4	153	−13 10.6	−112
13	13 30.6	1 23.4	02.5	113 40.9	45.8	295 37.8	45.0	156 31.7	49.3	174 44.7	153	13 21.8	−111
14	28 33.1	16 23.0	03.8	128 42.1	46.0	310 40.0	45.1	171 34.3	49.3	189 19.0	153	13 32.9	−111
15	43 35.6	31 22.6	·· 05.0	143 43.3	·· 46.1	325 42.1	·· 45.1	186 36.9	·· 49.2	203 53.3	152	·13 44.0	−110
16	58 38.0	46 22.3	06.3	158 44.5	46.2	340 44.3	45.1	201 39.4	49.2	218 27.5	151	13 55.0	−109
17	73 40.5	61 21.9	07.6	173 45.7	46.4	355 46.4	45.2	216 42.0	49.1	233 01.6	151	14 05.9	−109
18	88 42.9	76 21.5	+ 4 08.9	188 46.9	−22 46.5	10 48.5	+22 45.2	231 44.6	−11 49.1	247 35.7	151	−14 16.8	−108
19	103 45.4	91 21.1	10.1	203 48.1	46.6	25 50.7	45.2	246 47.2	49.0	262 09.8	150	14 27.6	−108
20	118 47.9	106 20.8	11.4	218 49.4	46.8	40 52.8	45.3	261 49.8	49.0	276 43.8	150	14 38.4	−107
21	133 50.3	121 20.4	·· 12.7	233 50.6	·· 46.9	55 55.0	·· 45.3	276 52.4	·· 48.9	291 17.8	149	·14 49.1	−107
22	148 52.8	136 20.0	13.9	248 51.8	47.0	70 57.1	45.3	291 55.0	48.9	305 51.7	149	14 59.8	−106
23	163 55.3	151 19.6	15.2	263 53.0	47.2	85 59.3	45.4	306 57.5	48.9	320 25.6	149	15 10.4	−105
22 0	178 57.7	166 19.3	+ 4 16.5	278 54.2	−22 47.3	101 01.4	+22 45.4	322 00.1	−11 48.8	334 59.5	148	−15 20.9	−105
1	194 00.2	181 18.9	17.7	293 55.4	47.4	116 03.6	45.4	337 02.7	48.8	349 33.3	147	15 31.4	−104
2	209 02.7	196 18.5	19.0	308 56.6	47.6	131 05.7	45.5	352 05.3	48.7	4 07.0	147	15 41.8	−104
3	224 05.1	211 18.1	·· 20.3	323 57.8	·· 47.7	146 07.8	·· 45.5	7 07.9	·· 48.7	18 40.7	146	·15 52.2	−103
4	239 07.6	226 17.8	21.5	338 59.0	47.8	161 10.0	45.5	22 10.5	48.6	33 14.3	146	16 02.5	−102
5	254 10.1	241 17.4	22.8	354 00.2	47.9	176 12.1	45.5	37 13.1	48.6	47 47.9	146	16 12.7	−101
6	269 12.5	256 17.0	+ 4 24.1	9 01.4	−22 48.1	191 14.3	+22 45.6	52 15.7	−11 48.5	62 21.5	145	−16 22.8	−101
7	284 15.0	271 16.6	25.3	24 02.6	48.2	206 16.4	45.6	67 18.2	48.5	76 55.0	144	16 32.9	−101
8	299 17.4	286 16.3	26.6	39 03.8	48.3	221 18.6	45.6	82 20.8	48.4	91 28.4	144	16 43.0	− 99
9	314 19.9	301 15.9	·· 27.9	54 05.0	·· 48.5	236 20.7	·· 45.7	97 23.4	·· 48.4	106 01.8	144	·16 52.9	− 99
10	329 22.4	316 15.5	29.1	69 06.2	48.6	251 22.8	45.7	112 26.0	48.3	120 35.2	143	17 02.8	− 98
11	344 24.8	331 15.1	30.4	84 07.5	48.7	266 25.0	45.7	127 28.6	48.3	135 08.5	142	17 12.6	− 98
12	359 27.3	346 14.8	+ 4 31.7	99 08.7	−22 48.9	281 27.1	+22 45.8	142 31.2	−11 48.2	149 41.7	142	−17 22.4	− 96
13	14 29.8	1 14.4	32.9	114 09.9	49.0	296 29.3	45.8	157 33.8	48.2	164 14.9	141	17 32.0	− 96
14	29 32.2	16 14.0	34.2	129 11.1	49.1	311 31.4	45.8	172 36.4	48.1	178 48.0	141	17 41.6	− 96
15	44 34.7	31 13.6	·· 35.5	144 12.3	·· 49.2	326 33.5	·· 45.9	187 38.9	·· 48.1	193 21.1	140	·17 51.2	− 94
16	59 37.2	46 13.3	36.7	159 13.5	49.4	341 35.7	45.9	202 41.5	48.0	207 54.1	140	18 00.6	− 94
17	74 39.6	61 12.9	38.0	174 14.7	49.5	356 37.8	45.9	217 44.1	48.0	222 27.1	139	18 10.0	− 93
18	89 42.1	76 12.5	+ 4 39.3	189 15.9	−22 49.6	11 40.0	+22 45.9	232 46.7	−11 47.9	237 00.0	139	−18 19.3	− 93
19	104 44.5	91 12.1	40.5	204 17.1	49.8	26 42.1	46.0	247 49.3	47.9	251 32.9	138	18 28.6	− 91
20	119 47.0	106 11.8	41.8	219 18.3	49.9	41 44.2	46.0	262 51.9	47.8	266 05.7	137	18 37.7	− 91
21	134 49.5	121 11.4	·· 43.1	234 19.6	·· 50.0	56 46.4	·· 46.0	277 54.5	·· 47.8	280 38.4	137	·18 46.8	− 90
22	149 51.9	136 11.0	44.3	249 20.8	50.2	71 48.5	46.1	292 57.1	47.7	295 11.1	136	18 55.8	− 89
23	164 54.4	151 10.6	45.6	264 22.0	50.3	86 50.7	46.1	307 59.7	47.7	309 43.7	136	19 04.7	− 89
24	179 56.9	166 10.2	+ 4 46.8	279 23.2	−22 50.4	101 52.8	+22 46.1	323 02.2	−11 47.7	324 16.3	135	−19 13.6	− 88
code	–	− 4	+ 13	+ 12	− 1	+ 21	0	+ 26	+ 1				

GMT		SUN GHA	SUN Dec.
d	h	° ′	° ′
20	0	178 03.1	− 0 27.6
	1	193 03.3	26.6
	2	208 03.5	25.6
	3	223 03.6	·· 24.6
	4	238 03.8	23.6
	5	253 04.0	22.6
	6	268 04.2	− 0 21.6
	7	283 04.4	20.6
	8	298 04.6	19.7
	9	313 04.8	·· 18.7
	10	328 04.9	17.7
	11	343 05.1	16.7
	12	358 05.3	− 0 15.7
	13	13 05.5	14.7
	14	28 05.7	13.7
	15	43 05.9	·· 12.7
	16	58 06.1	11.8
	17	73 06.2	10.8
	18	88 06.4	− 0 09.8
	19	103 06.6	08.8
	20	118 06.8	07.8
	21	133 07.0	·· 06.8
	22	148 07.2	05.8
	23	163 07.4	04.8
21	0	178 07.6	− 0 03.9
	1	193 07.7	02.9
	2	208 07.9	01.9
	3	223 08.1	− 0 00.9
	4	238 08.3	+ 0 00.1
	5	253 08.5	01.1
	6	268 08.7	+ 0 02.1
	7	283 08.9	03.1
	8	298 09.1	04.0
	9	313 09.2	·· 05.0
	10	328 09.4	06.0
	11	343 09.6	07.0
	12	358 09.8	+ 0 08.0
	13	13 10.0	09.0
	14	28 10.2	10.0
	15	43 10.4	·· 11.0
	16	58 10.6	11.9
	17	73 10.7	12.9
	18	88 10.9	+ 0 13.9
	19	103 11.1	14.9
	20	118 11.3	15.9
	21	133 11.5	·· 16.9
	22	148 11.7	17.9
	23	163 11.9	18.9
22	0	178 12.1	+ 0 19.8
	1	193 12.3	20.8
	2	208 12.4	21.8
	3	223 12.6	·· 22.8
	4	238 12.8	23.8
	5	253 13.0	24.8
	6	268 13.2	+ 0 25.8
	7	283 13.4	26.7
	8	298 13.6	27.7
	9	313 13.8	·· 28.7
	10	328 14.0	29.7
	11	343 14.1	30.7
	12	358 14.3	+ 0 31.7
	13	13 14.5	32.7
	14	28 14.7	33.7
	15	43 14.9	·· 34.6
	16	58 15.1	35.6
	17	73 15.3	36.6
	18	88 15.5	+ 0 37.6
	19	103 15.7	38.6
	20	118 15.8	39.6
	21	133 16.0	·· 40.6
	22	148 16.2	41.5
	23	163 16.4	42.5
	24	178 16.6	+ 0 43.5
code		—	+ 10

STARS

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 52.2	−40 29.4
5	Achernar	336 00.1	−57 28.2
30	Acrux	173 58.6	−62 50.9
19	Adhara	255 47.4	−28 54.7
10	Aldebaran	291 40.5	+16 25.2
32	Alioth	166 58.8	+56 12.2
34	Alkaid	153 33.2	+49 32.2
55	Al Na'ir	28 39.7	−47 10.9
15	Alnilam	276 31.5	− 1 13.8
25	Alphard	218 39.5	− 8 27.8
41	Alphecca	126 48.4	+26 51.7
1	Alpheratz	358 29.9	+28 50.3
51	Altair	62 51.7	+ 8 44.6
2	Ankaa	353 59.7	−42 33.3
42	Antares	113 20.6	−26 20.0
37	Arcturus	146 35.9	+19 24.9
43	Atria	109 02.3	−68 56.7
22	Avior	234 36.0	−59 22.0
13	Bellatrix	279 19.7	+ 6 18.6
16	Betelg'se	271 49.4	+ 7 24.0
17	Canopus	264 15.8	−52 40.5
12	Capella	281 40.2	+45 57.4
53	Deneb	50 02.1	+45 06.7
28	Denebola	183 18.5	+14 49.5
4	Diphda	349 40.7	−18 14.3
27	Dubhe	194 45.2	+61 59.8
14	Elnath	279 08.8	+28 34.3
47	Eltanin	91 06.8	+51 29.2
54	Enif	34 31.0	+ 9 39.7
56	Fomalhaut	16 13.2	−29 51.9
31	Gacrux	172 50.1	−56 51.6
29	Gienah	176 37.7	−17 17.5
35	Hadar	149 50.6	−60 09.2
6	Hamal	328 51.2	+23 14.9
48	Kaus Aust.	84 42.7	−34 24.5
40	Kochab	137 16.8	+74 20.2
57	Markab	14 22.9	+14 57.5
8	Menkar	315 01.7	+ 3 54.7
36	Menkent	148 59.7	−36 08.9
24	Miapl'dus	221 48.8	−69 32.0
9	Mirfak	309 44.4	+49 42.2
50	Nunki	76 53.4	−26 21.4
52	Peacock	54 29.3	−56 52.9
21	Pollux	244 21.8	+28 08.3
20	Procyon	245 46.0	+ 5 20.5
46	R'alhague	96 47.6	+12 35.2
26	Regulus	208 30.4	+12 11.3
11	Rigel	281 54.8	− 8 15.3
38	Rigil Kent.	140 52.1	−60 38.9
44	Sabik	103 03.4	−15 40.3
3	Schedar	350 32.0	+56 17.3
45	Shaula	97 22.2	−37 04.3
18	Sirius	259 12.8	−16 39.3
33	Spica	159 17.8	−10 55.6
23	Suhail	223 24.9	−43 15.1
49	Vega	81 09.1	+38 44.1
39	Zub'g'bi	137 54.4	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 20	21	22	23
N °	h m	h m	h m	h m	h m	h m
72	5 56	0 13	21 12	23 30	■	■
70	5 57	1 52	20 55	22 52	25 36	1 36
68	5 58	2 28	20 41	22 26	24 26	0 26
66	5 58	2 52	20 29	22 06	23 50	25 49
64	5 59	3 11	20 20	21 50	23 25	25 03
62	6 00	3 25	20 12	21 37	23 05	24 34
60	6 00	3 37	20 05	21 26	22 49	24 11
58	6 01	3 46	19 59	21 17	22 35	23 53
56	6 01	3 56	19 54	21 08	22 23	23 38
54	6 01	4 03	19 49	21 01	22 13	23 25
52	6 02	4 09	19 45	20 54	22 04	23 14
50	6 02	4 14	19 41	20 48	21 56	23 03
45	6 02	4 25	19 33	20 36	21 39	22 42
40	6 03	4 33	19 26	20 25	21 25	22 25
35	6 03	4 39	19 20	20 16	21 14	22 11
30	6 03	4 45	19 15	20 09	21 03	21 59
20	6 04	4 52	19 06	19 55	20 46	21 38
10	6 04	4 55	18 58	19 43	20 31	21 20
0	6 04	4 55	18 51	19 33	20 17	21 03
10	6 04	4 54	18 44	19 22	20 03	20 46
20	6 04	4 51	18 36	19 11	19 48	20 28
30	6 04	4 43	18 27	18 57	19 31	20 07
35	6 04	4 38	18 22	18 50	19 21	19 55
40	6 03	4 31	18 17	18 42	19 09	19 42
45	6 03	4 23	18 10	18 32	18 56	19 25
50	6 03	4 11	18 03	18 20	18 40	19 06
52	6 03	4 06	17 59	18 14	18 33	18 56
54	6 02	3 59	17 55	18 08	18 25	18 46
56	6 02	3 52	17 51	18 02	18 15	18 34
58	6 02	3 43	17 46	17 54	18 05	18 20
60 S	6 01	3 33	17 41	17 46	17 53	18 04

Lat.	Sunset	Twlt. ends	Moonset 20	21	22	23
N °	h m	h m	h m	h m	h m	h m
72	18 21	////	4 57	4 26	3 37	■
70	18 20	22 35	5 07	4 46	4 16	3 06
68	18 19	21 56	5 15	5 01	4 44	4 15
66	18 18	21 30	5 22	5 14	5 05	4 52
64	18 17	21 10	5 28	5 25	5 21	5 19
62	18 16	20 55	5 33	5 34	5 36	5 39
60	18 16	20 43	5 37	5 42	5 47	5 56
58	18 15	20 32	5 41	5 48	5 58	6 10
56	18 15	20 24	5 45	5 55	6 07	6 22
54	18 14	20 16	5 48	6 00	6 15	6 33
52	18 14	20 10	5 51	6 05	6 22	6 42
50	18 14	20 04	5 53	6 10	6 28	6 51
45	18 13	19 52	5 59	6 20	6 42	7 09
40	18 13	19 44	6 04	6 28	6 54	7 24
35	18 12	19 37	6 08	6 35	7 04	7 36
30	18 12	19 32	6 12	6 41	7 13	7 47
20	18 11	19 24	6 18	6 52	7 28	8 06
10	18 11	19 21	6 24	7 02	7 41	8 23
0	18 11	19 20	6 29	7 11	7 54	8 39
10	18 10	19 20	6 35	7 20	8 06	8 54
20	18 10	19 23	6 41	7 30	8 19	9 11
30	18 10	19 30	6 47	7 41	8 35	9 30
35	18 10	19 34	6 51	7 47	8 44	9 41
40	18 11	19 42	6 55	7 54	8 54	9 54
45	18 11	19 50	7 00	8 03	9 06	10 10
50	18 11	20 00	7 06	8 13	9 21	10 29
52	18 11	20 06	7 09	8 18	9 28	10 38
54	18 11	20 12	7 12	8 24	9 36	10 48
56	18 11	20 19	7 15	8 29	9 44	10 59
58	18 12	20 28	7 19	8 36	9 54	11 12
60 S	18 12	20 37	7 23	8 44	10 05	11 28

GMT	Equation of Time (App.—Mean) 20	21	22
h	m s	m s	m s
0	− 7 48.1	− 7 30.1	− 7 12.1
6	− 7 43.6	− 7 25.6	− 7 07.6
12	− 7 39.1	− 7 21.1	− 7 03.1
18	− 7 34.6	− 7 16.6	− 6 58.5
24	− 7 30.1	− 7 12.1	− 6 54.0

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
20	0 20	12 54	5 28	17 20	2 40
21	1 01	12 54	5 26	17 17	2 36
22	1 43	12 55	5 24	17 14	2 32
23	2 27	12 56	5 22	17 10	2 27

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.4	0.1	0.1
30			
	0.4	0.1	0.1
45			
	0.4	0.1	0.1
60			
	0.4	0.0	0.1
75			
	0.4	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	20	21	22
°	′	′	′
0			
	11.9	11.7	11.7
4			
	11.9	11.7	11.7
8			
	11.9	11.8	11.8
12			
	11.9	11.8	11.8
16			
	12.0	11.9	11.9
20			
	12.1	12.0	12.0
24			
	12.2	12.0	12.0
28			
	12.2	12.1	12.1
32			
	12.4	12.2	12.2
36			
	12.5	12.4	12.4
40			
	12.6	12.5	12.5
44			
	12.7	12.6	12.6
48			
	12.9	12.8	12.8
52			
	13.1	13.0	13.0
56			
	13.2	13.1	13.1
60			
	13.4	13.3	13.3
64			
	13.6	13.5	13.5
68			
	13.8	13.7	13.7
72			
	14.0	13.9	13.9
76			
	14.2	14.1	14.1
80			
	14.4	14.3	14.3
84			
	14.6	14.5	14.5
88			
	14.7	14.7	14.7
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	20	21	22
°	′	′	′
0			
	17.7	17.7	17.7
4			
	17.6	17.7	17.7
8			
	17.6	17.7	17.7
12			
	17.6	17.6	17.6
16			
	17.5	17.6	17.6
20			
	17.5	17.5	17.5
24			
	17.4	17.4	17.4
28			
	17.3	17.3	17.3
32			
	17.2	17.2	17.2
36			
	17.0	17.1	17.1
40			
	16.9	17.0	17.0
44			
	16.8	16.8	16.8
48			
	16.6	16.7	16.7
52			
	16.5	16.5	16.5
56			
	16.3	16.3	16.3
60			
	16.1	16.1	16.1
64			
	15.9	16.0	16.0
68			
	15.8	15.8	15.8
72			
	15.6	15.6	15.6
76			
	15.4	15.4	15.4
80			
	15.2	15.2	15.2
84			
	15.0	14.9	14.9
88			
	14.8	14.8	14.8
90			

Subtract from table, back cover

992941°—53——4

GMT	♈ GHA	VENUS −3.4 GHA	VENUS Dec.	MARS 0.3 GHA	MARS Dec.	JUPITER −1.8 GHA	JUPITER Dec.	SATURN 0.5 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
23 0	179 56.9	166 10.2	+ 4 46.8	279 23.2	−22 50.4	101 52.8	+22 46.1	323 02.2	−11 47.7	324 16.3	135	−19 13.6	− 88
1	194 59.3	181 09.9	48.1	294 24.4	50.5	116 54.9	46.2	338 04.8	47.6	338 48.8	135	19 22.4	− 86
2	210 01.8	196 09.5	49.4	309 25.6	50.7	131 57.1	46.2	353 07.4	47.6	353 21.3	134	19 31.0	− 86
3	225 04.3	211 09.1	·· 50.6	324 26.8	·· 50.8	146 59.2	·· 46.2	8 10.0	·· 47.5	7 53.7	133	·19 39.6	− 86
4	240 06.7	226 08.7	51.9	339 28.1	50.9	162 01.3	46.3	23 12.6	47.5	22 26.0	133	19 48.2	− 84
5	255 09.2	241 08.4	53.2	354 29.3	51.0	177 03.5	46.3	38 15.2	47.4	36 58.3	132	19 56.6	− 84
6	270 11.7	256 08.0	+ 4 54.4	9 30.5	−22 51.2	192 05.6	+22 46.3	53 17.8	−11 47.4	51 30.5	132	−20 05.0	− 82
7	285 14.1	271 07.6	55.7	24 31.7	51.3	207 07.8	46.4	68 20.4	47.3	66 02.7	131	20 13.2	− 82
8	300 16.6	286 07.2	56.9	39 32.9	51.4	222 09.9	46.4	83 23.0	47.3	80 34.8	131	20 21.4	− 81
9	315 19.0	301 06.8	·· 58.2	54 34.1	·· 51.6	237 12.0	·· 46.4	98 25.6	·· 47.2	95 06.9	130	·20 29.5	− 80
10	330 21.5	316 06.5	4 59.5	69 35.4	51.7	252 14.2	46.4	113 28.1	47.2	109 38.9	129	20 37.5	− 79
11	345 24.0	331 06.1	5 00.7	84 36.6	51.8	267 16.3	46.5	128 30.7	47.1	124 10.8	129	20 45.4	− 79
12	0 26.4	346 05.7	+ 5 02.0	99 37.8	−22 51.9	282 18.4	+22 46.5	143 33.3	−11 47.1	138 42.7	128	−20 53.3	− 77
13	15 28.9	1 05.3	03.3	114 39.0	52.1	297 20.6	46.5	158 35.9	47.0	153 14.5	127	21 01.0	− 77
14	30 31.4	16 04.9	04.5	129 40.2	52.2	312 22.7	46.6	173 38.5	47.0	167 46.2	127	21 08.7	− 75
15	45 33.8	31 04.6	·· 05.8	144 41.4	·· 52.3	327 24.8	·· 46.6	188 41.1	·· 46.9	182 17.9	126	·21 16.2	− 75
16	60 36.3	46 04.2	07.0	159 42.7	52.4	342 27.0	46.6	203 43.7	46.9	196 49.5	126	21 23.7	− 74
17	75 38.8	61 03.8	08.3	174 43.9	52.6	357 29.1	46.7	218 46.3	46.8	211 21.1	125	21 31.1	− 73
18	90 41.2	76 03.4	+ 5 09.6	189 45.1	−22 52.7	12 31.2	+22 46.7	233 48.9	−11 46.8	225 52.6	125	−21 38.4	− 72
19	105 43.7	91 03.0	10.8	204 46.3	52.8	27 33.4	46.7	248 51.5	46.7	240 24.1	124	21 45.6	− 71
20	120 46.2	106 02.7	12.1	219 47.5	52.9	42 35.5	46.8	263 54.1	46.7	254 55.5	123	21 52.7	− 70
21	135 48.6	121 02.3	·· 13.3	234 48.8	·· 53.1	57 37.6	·· 46.8	278 56.7	·· 46.6	269 26.8	123	·21 59.7	− 69
22	150 51.1	136 01.9	14.6	249 50.0	53.2	72 39.8	46.8	293 59.2	46.6	283 58.1	122	22 06.6	− 68
23	165 53.5	151 01.5	15.9	264 51.2	53.3	87 41.9	46.9	309 01.8	46.5	298 29.3	121	22 13.4	− 67
24 0	180 56.0	166 01.1	+ 5 17.1	279 52.4	−22 53.4	102 44.0	+22 46.9	324 04.4	−11 46.5	313 00.4	121	−22 20.1	− 66
1	195 58.5	181 00.8	18.4	294 53.7	53.6	117 46.2	46.9	339 07.0	46.4	327 31.5	120	22 26.7	− 65
2	211 00.9	196 00.4	19.6	309 54.9	53.7	132 48.3	46.9	354 09.6	46.4	342 02.5	120	22 33.2	− 64
3	226 03.4	211 00.0	·· 20.9	324 56.1	·· 53.8	147 50.4	·· 47.0	9 12.2	·· 46.3	356 33.5	119	·22 39.6	− 63
4	241 05.9	225 59.6	22.2	339 57.3	53.9	162 52.5	47.0	24 14.8	46.3	11 04.4	119	22 45.9	− 62
5	256 08.3	240 59.2	23.4	354 58.5	54.1	177 54.7	47.0	39 17.4	46.2	25 35.3	118	22 52.1	− 61
6	271 10.8	255 58.9	+ 5 24.7	9 59.8	−22 54.2	192 56.8	+22 47.1	54 20.0	−11 46.2	40 06.1	117	−22 58.2	− 60
7	286 13.3	270 58.5	25.9	25 01.0	54.3	207 58.9	47.1	69 22.6	46.1	54 36.8	117	23 04.2	− 59
8	301 15.7	285 58.1	27.2	40 02.2	54.4	223 01.1	47.1	84 25.2	46.1	69 07.5	116	23 10.1	− 58
9	316 18.2	300 57.7	·· 28.4	55 03.4	·· 54.6	238 03.2	·· 47.2	99 27.8	·· 46.0	83 38.1	115	·23 15.9	− 57
10	331 20.6	315 57.3	29.7	70 04.7	54.7	253 05.3	47.2	114 30.4	46.0	98 08.6	115	23 21.6	− 56
11	346 23.1	330 56.9	31.0	85 05.9	54.8	268 07.4	47.2	129 33.0	45.9	112 39.1	115	23 27.2	− 55
12	1 25.6	345 56.6	+ 5 32.2	100 07.1	−22 54.9	283 09.6	+22 47.3	144 35.6	−11 45.9	127 09.6	114	−23 32.7	− 54
13	16 28.0	0 56.2	33.5	115 08.4	55.1	298 11.7	47.3	159 38.2	45.8	141 40.0	113	23 38.1	− 52
14	31 30.5	15 55.8	34.7	130 09.6	55.2	313 13.8	47.3	174 40.7	45.8	156 10.3	112	23 43.3	− 52
15	46 33.0	30 55.4	·· 36.0	145 10.8	·· 55.3	328 16.0	·· 47.4	189 43.3	·· 45.7	170 40.5	113	·23 48.5	− 50
16	61 35.4	45 55.0	37.3	160 12.0	55.4	343 18.1	47.4	204 45.9	45.7	185 10.8	111	23 53.5	− 49
17	76 37.9	60 54.6	38.5	175 13.3	55.5	358 20.2	47.4	219 48.5	45.6	199 40.9	111	23 58.4	− 49
18	91 40.4	75 54.3	+ 5 39.8	190 14.5	−22 55.7	13 22.3	+22 47.5	234 51.1	−11 45.6	214 11.0	110	−24 03.3	− 47
19	106 42.8	90 53.9	41.0	205 15.7	55.8	28 24.5	47.5	249 53.7	45.5	228 41.0	110	24 08.0	− 46
20	121 45.3	105 53.5	42.3	220 16.9	55.9	43 26.6	47.5	264 56.3	45.5	243 11.0	109	24 12.6	− 45
21	136 47.8	120 53.1	·· 43.5	235 18.2	·· 56.0	58 28.7	·· 47.5	279 58.9	·· 45.4	257 40.9	109	·24 17.1	− 43
22	151 50.2	135 52.7	44.8	250 19.4	56.2	73 30.8	47.6	295 01.5	45.4	272 10.8	108	24 21.4	− 43
23	166 52.7	150 52.3	46.0	265 20.6	56.3	88 33.0	47.6	310 04.1	45.3	286 40.6	108	24 25.7	− 41
25 0	181 55.1	165 52.0	+ 5 47.3	280 21.9	−22 56.4	103 35.1	+22 47.6	325 06.7	−11 45.3	301 10.4	107	−24 29.8	− 41
1	196 57.6	180 51.6	48.5	295 23.1	56.5	118 37.2	47.7	340 09.3	45.2	315 40.1	107	24 33.9	− 39
2	212 00.1	195 51.2	49.8	310 24.3	56.6	133 39.3	47.7	355 11.9	45.2	330 09.8	106	24 37.8	− 38
3	227 02.5	210 50.8	·· 51.1	325 25.6	·· 56.8	148 41.5	·· 47.7	10 14.5	·· 45.1	344 39.4	105	·24 41.6	− 37
4	242 05.0	225 50.4	52.3	340 26.8	56.9	163 43.6	47.8	25 17.1	45.1	359 08.9	105	24 45.3	− 35
5	257 07.5	240 50.0	53.6	355 28.0	57.0	178 45.7	47.8	40 19.7	45.0	13 38.4	105	24 48.8	− 35
6	272 09.9	255 49.7	+ 5 54.8	10 29.3	−22 57.1	193 47.8	+22 47.8	55 22.3	−11 45.0	28 07.9	104	−24 52.3	− 33
7	287 12.4	270 49.3	56.1	25 30.5	57.2	208 50.0	47.9	70 24.9	44.9	42 37.3	104	24 55.6	− 32
8	302 14.9	285 48.9	57.3	40 31.7	57.4	223 52.1	47.9	85 27.5	44.9	57 06.7	103	24 58.8	− 31
9	317 17.3	300 48.5	·· 58.6	55 33.0	·· 57.5	238 54.2	·· 47.9	100 30.1	·· 44.8	71 36.0	102	·25 01.9	− 29
10	332 19.8	315 48.1	5 59.8	70 34.2	57.6	253 56.3	48.0	115 32.7	44.8	86 05.2	102	25 04.8	− 29
11	347 22.3	330 47.7	6 01.1	85 35.4	57.7	268 58.4	48.0	130 35.3	44.7	100 34.4	102	25 07.7	− 27
12	2 24.7	345 47.3	+ 6 02.3	100 36.7	−22 57.8	284 00.6	+22 48.0	145 37.9	−11 44.7	115 03.6	101	−25 10.4	− 26
13	17 27.2	0 47.0	03.6	115 37.9	58.0	299 02.7	48.1	160 40.5	44.6	129 32.7	101	25 13.0	− 24
14	32 29.6	15 46.6	04.8	130 39.1	58.1	314 04.8	48.1	175 43.1	44.6	144 01.8	100	25 15.4	− 24
15	47 32.1	30 46.2	·· 06.1	145 40.4	·· 58.2	329 06.9	·· 48.1	190 45.7	·· 44.5	158 30.8	100	·25 17.8	− 22
16	62 34.6	45 45.8	07.3	160 41.6	58.3	344 09.0	48.1	205 48.2	44.5	172 59.8	99	25 20.0	− 21
17	77 37.0	60 45.4	08.6	175 42.9	58.4	359 11.2	48.2	220 50.8	44.4	187 28.7	99	25 22.1	− 20
18	92 39.5	75 45.0	+ 6 09.8	190 44.1	−22 58.6	14 13.3	+22 48.2	235 53.4	−11 44.4	201 57.6	99	−25 24.1	− 18
19	107 42.0	90 44.6	11.1	205 45.3	58.7	29 15.4	48.2	250 56.0	44.3	216 26.5	98	25 25.9	− 17
20	122 44.4	105 44.2	12.3	220 46.6	58.8	44 17.5	48.3	265 58.6	44.3	230 55.3	97	25 27.6	− 16
21	137 46.9	120 43.9	·· 13.6	235 47.8	·· 58.9	59 19.6	·· 48.3	281 01.2	·· 44.2	245 24.0	98	·25 29.2	− 15
22	152 49.4	135 43.5	14.8	250 49.0	59.0	74 21.8	48.3	296 03.8	44.2	259 52.8	97	25 30.7	− 13
23	167 51.8	150 43.1	16.1	265 50.3	59.2	89 23.9	48.4	311 06.4	44.1	274 21.5	96	25 32.0	− 12
24	182 54.3	165 42.7	+ 6 17.3	280 51.5	−22 59.3	104 26.0	+22 48.4	326 09.0	−11 44.1	288 50.1	96	−25 33.2	− 11
code	—	− 4	+ 13	+ 13	− 2	+ 21	0	+ 26	+ 1				

GMT		SUN GHA	SUN Dec.
	h	° ′	° ′
23	0	178 16.6	+ 0 43.5
	1	193 16.8	44.5
	2	208 17.0	45.5
	3	223 17.2 ••	46.5
	4	238 17.4	47.5
	5	253 17.6	48.4
	6	268 17.7	+ 0 49.4
	7	283 17.9	50.4
	8	298 18.1	51.4
	9	313 18.3 ••	52.4
	10	328 18.5	53.4
	11	343 18.7	54.4
	12	358 18.9	+ 0 55.3
	13	13 19.1	56.3
	14	28 19.3	57.3
	15	43 19.4 ••	58.3
	16	58 19.6	0 59.3
	17	73 19.8	1 00.3
	18	88 20.0	+ 1 01.3
	19	103 20.2	02.2
	20	118 20.4	03.2
	21	133 20.6 ••	04.2
	22	148 20.8	05.2
	23	163 21.0	06.2
24	0	178 21.2	+ 1 07.2
	1	193 21.3	08.2
	2	208 21.5	09.1
	3	223 21.7 ••	10.1
	4	238 21.9	11.1
	5	253 22.1	12.1
	6	268 22.3	+ 1 13.1
	7	283 22.5	14.1
	8	298 22.7	15.0
	9	313 22.9 ••	16.0
	10	328 23.1	17.0
	11	343 23.2	18.0
	12	358 23.4	+ 1 19.0
	13	13 23.6	20.0
	14	28 23.8	21.0
	15	43 24.0 ••	21.9
	16	58 24.2	22.9
	17	73 24.4	23.9
	18	88 24.6	+ 1 24.9
	19	103 24.8	25.9
	20	118 25.0	26.9
	21	133 25.2 ••	27.8
	22	148 25.3	28.8
	23	163 25.5	29.8
25	0	178 25.7	+ 1 30.8
	1	193 25.9	31.8
	2	208 26.1	32.8
	3	223 26.3 ••	33.7
	4	238 26.5	34.7
	5	253 26.7	35.7
	6	268 26.9	+ 1 36.7
	7	283 27.1	37.7
	8	298 27.2	38.7
	9	313 27.4 ••	39.6
	10	328 27.6	40.6
	11	343 27.8	41.6
	12	358 28.0	+ 1 42.6
	13	13 28.2	43.6
	14	28 28.4	44.6
	15	43 28.6 ••	45.5
	16	58 28.8	46.5
	17	73 29.0	47.5
	18	88 29.2	+ 1 48.5
	19	103 29.3	49.5
	20	118 29.5	50.4
	21	133 29.7 ••	51.4
	22	148 29.9	52.4
	23	163 30.1	53.4
	24	178 30.3	+ 1 54.4
code		—	+ 10

STARS No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 52.2	−40 29.3
5	Achernar	336 00.1	−57 28.2
30	Acrux	173 58.6	−62 50.9
19	Adhara	255 47.4	−28 54.7
10	Aldebaran	291 40.5	+16 25.2
32	Alioth	166 58.8	+56 12.2
34	Alkaid	153 33.2	+49 32.2
55	Al Na'ir	28 39.7	−47 10.9
15	Alnilam	276 31.5	− 1 13.8
25	Alphard	218 39.5	− 8 27.8
41	Alphecca	126 48.3	+26 51.7
1	Alpheratz	358 29.9	+28 50.3
51	Altair	62 51.7	+ 8 44.6
2	Ankaa	353 59.7	−42 33.3
42	Antares	113 20.6	−26 20.0
37	Arcturus	146 35.9	+19 24.9
43	Atria	109 02.2	−68 56.7
22	Avior	234 36.0	−59 22.0
13	Bellatrix	279 19.7	+ 6 18.6
16	Betelg'se	271 49.4	+ 7 24.0
17	Canopus	264 15.9	−52 40.5
12	Capella	281 40.2	+45 57.4
53	Deneb	50 02.1	+45 06.7
28	Denebola	183 18.5	+14 49.5
4	Diphda	349 40.7	−18 14.3
27	Dubhe	194 45.2	+61 59.8
14	Elnath	279 08.8	+28 34.3
47	Eltanin	91 06.7	+51 29.2
54	Enif	34 31.0	+ 9 39.7
56	Fomalhaut	16 13.2	−29 51.9
31	Gacrux	172 50.1	−56 51.6
29	Gienah	176 37.7	−17 17.5
35	Hadar	149 50.6	−60 09.3
6	Hamal	328 51.3	+23 14.9
48	Kaus Aust.	84 42.7	−34 24.5
40	Kochab	137 16.7	+74 20.2
57	Markab	14 22.9	+14 57.5
8	Menkar	315 01.7	+ 3 54.7
36	Menkent	148 59.7	−36 08.9
24	Miapl'dus	221 48.8	−69 32.0
9	Mirfak	309 44.4	+49 42.2
50	Nunki	76 53.3	−26 21.3
52	Peacock	54 29.3	−56 52.9
21	Pollux	244 21.8	+28 08.3
20	Procyon	245 46.1	+ 5 20.5
46	R'alhague	96 47.6	+12 35.2
26	Regulus	208 30.4	+12 11.3
11	Rigel	281 54.8	− 8 15.3
38	Rigil Kent.	140 52.1	−60 39.0
44	Sabik	103 03.4	−15 40.3
3	Schedar	350 32.0	+56 17.3
45	Shaula	97 22.1	−37 04.3
18	Sirius	259 12.8	−16 39.3
33	Spica	159 17.8	−10 55.6
23	Suhail	223 24.9	−43 15.1
49	Vega	81 09.1	+38 44.1
39	Zub'g'bi	137 54.4	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 23	24	25	26
N °	h m	h m	h m	h m	h m	h m
72	5 40	////	■	■	■	■
70	5 43	1 16	1 36	■	■	■
68	5 45	2 05	0 26	■	■	■
66	5 47	2 35	25 49	1 49	■	■
64	5 49	2 56	25 03	1 03	2 45	4 18
62	5 50	3 12	24 34	0 34	1 59	3 11
60	5 51	3 26	24 11	0 11	1 29	2 36
58	5 52	3 37	23 53	25 07	1 07	2 11
56	5 53	3 46	23 38	24 48	0 48	1 51
54	5 54	3 53	23 25	24 33	0 33	1 34
52	5 55	4 01	23 14	24 20	0 20	1 20
50	5 55	4 06	23 03	24 08	0 08	1 07
45	5 57	4 19	22 42	23 44	24 41	0 41
40	5 58	4 29	22 25	23 24	24 21	0 21
35	5 59	4 35	22 11	23 08	24 04	0 04
30	6 00	4 41	21 59	22 54	23 49	24 41
20	6 01	4 49	21 38	22 31	23 24	24 16
10	6 02	4 53	21 20	22 10	23 02	23 55
0	6 03	4 54	21 03	21 51	22 42	23 35
10	6 04	4 54	20 46	21 33	22 22	23 15
20	6 05	4 52	20 28	21 12	22 01	22 54
30	6 06	4 45	20 07	20 49	21 36	22 29
35	6 06	4 41	19 55	20 35	21 22	22 15
40	6 07	4 35	19 42	20 20	21 05	21 58
45	6 07	4 28	19 25	20 01	20 45	21 38
50	6 07	4 17	19 06	19 38	20 19	21 12
52	6 08	4 12	18 56	19 27	20 07	21 00
54	6 08	4 06	18 46	19 14	19 53	20 46
56	6 08	3 59	18 34	19 00	19 37	20 29
58	6 08	3 51	18 20	18 43	19 18	20 10
60	6 09	3 42	18 04	18 22	18 54	19 45
S						

Lat.	Sunset	Twlt. ends	Moonset 23	24	25	26
N °	h m	h m	h m	h m	h m	h m
72	18 35	////	■	■	■	■
70	18 32	23 17	3 06	■	■	■
68	18 30	22 19	4 15	■	■	■
66	18 28	21 47	4 52	4 30	■	■
64	18 26	21 24	5 19	5 16	5 17	5 32
62	18 25	21 07	5 39	5 47	6 03	6 38
60	18 23	20 52	5 56	6 10	6 33	7 13
58	18 22	20 41	6 10	6 28	6 56	7 39
56	18 21	20 31	6 22	6 44	7 15	7 59
54	18 20	20 23	6 33	6 57	7 30	8 16
52	18 19	20 16	6 42	7 09	7 44	8 30
50	18 19	20 10	6 51	7 19	7 56	8 42
45	18 17	19 57	7 09	7 41	8 20	9 08
40	18 16	19 47	7 24	7 59	8 40	9 29
35	18 15	19 40	7 36	8 14	8 57	9 46
30	18 14	19 34	7 47	8 27	9 11	10 01
20	18 12	19 25	8 06	8 49	9 35	10 26
10	18 11	19 21	8 23	9 08	9 56	10 47
0	18 10	19 19	8 39	9 26	10 16	11 08
10	18 09	19 19	8 54	9 44	10 35	11 28
20	18 08	19 21	9 11	10 03	10 56	11 49
30	18 07	19 27	9 30	10 26	11 21	12 14
35	18 06	19 30	9 41	10 39	11 35	12 29
40	18 06	19 36	9 54	10 54	11 52	12 46
45	18 05	19 43	10 10	11 12	12 12	13 06
50	18 05	19 54	10 29	11 35	12 37	13 32
52	18 04	19 58	10 38	11 46	12 49	13 44
54	18 04	20 04	10 48	11 58	13 03	13 58
56	18 04	20 10	10 59	12 12	13 19	14 15
58	18 03	20 17	11 12	12 28	13 38	14 34
60	18 03	20 26	11 28	12 49	14 02	14 59
S						

GMT	Equation of Time (App.—Mean) 23	24	25
h	m s	m s	m s
0	− 6 54.0	− 6 35.8	− 6 17.5
6	− 6 49.4	− 6 31.2	− 6 12.9
12	− 6 44.9	− 6 26.6	− 6 08.4
18	− 6 40.3	− 6 22.1	− 6 03.8
24	− 6 35.8	− 6 17.5	− 5 59.2

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
23	2 27	12 56	5 22	17 10	2 27
24	3 14	12 56	5 20	17 07	2 23
25	4 04	12 57	5 18	17 03	2 19
26	4 55	12 58	5 16	17 00	2 15

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.4	0.1	0.1
30			
	0.4	0.1	0.1
45			
	0.4	0.1	0.1
60			
	0.4	0.0	0.1
75			
	0.4	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	23	24	25
°	′	′	′
0			
	12.0	12.2	12.8
4			
	12.0	12.3	12.8
8			
	12.0	12.3	12.8
12			
	12.1	12.3	12.8
16			
	12.1	12.4	12.9
20			
	12.2	12.4	12.9
24			
	12.3	12.5	13.0
28			
	12.4	12.6	13.0
32			
	12.5	12.7	13.1
36			
	12.6	12.8	13.2
40			
	12.7	12.9	13.3
44			
	12.8	13.0	13.4
48			
	13.0	13.2	13.5
52			
	13.1	13.3	13.7
56			
	13.3	13.5	13.8
60			
	13.5	13.6	13.9
64			
	13.6	13.8	14.1
68			
	13.8	14.0	14.2
72			
	14.0	14.1	14.3
76			
	14.2	14.3	14.5
80			
	14.4	14.5	14.6
84			
	14.6	14.7	14.8
88			
	14.7	14.8	14.9
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	23	24	25
°	′	′	′
0			
	17.6	17.4	17.2
4			
	17.6	17.4	17.1
8			
	17.5	17.4	17.1
12			
	17.5	17.4	17.1
16			
	17.5	17.3	17.0
20			
	17.4	17.3	17.0
24			
	17.3	17.2	16.9
28			
	17.2	17.1	16.9
32			
	17.1	17.0	16.8
36			
	17.0	16.9	16.7
40			
	16.9	16.8	16.6
44			
	16.7	16.6	16.5
48			
	16.6	16.5	16.4
52			
	16.4	16.4	16.2
56			
	16.3	16.2	16.1
60			
	16.1	16.1	16.0
64			
	15.9	15.9	15.8
68			
	15.7	15.7	15.7
72			
	15.6	15.6	15.6
76			
	15.4	15.4	15.4
80			
	15.2	15.2	15.3
84			
	15.0	15.0	15.1
88			
	14.8	14.9	15.0
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −3.4 GHA	VENUS Dec.	MARS 0.3 GHA	MARS Dec.	JUPITER −1.8 GHA	JUPITER Dec.	SATURN 0.5 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
26 0	182 54.3	165 42.7	+ 6 17.3	280 51.5	−22 59.3	104 26.0	+22 48.4	326 09.0	−11 44.1	288 50.1	96	−25 33.2	− 11
1	197 56.7	180 42.3	18.6	295 52.8	59.4	119 28.1	48.4	341 11.6	44.0	303 18.7	96	25 34.3	− 10
2	212 59.2	195 41.9	19.8	310 54.0	59.5	134 30.2	48.5	356 14.2	44.0	317 47.3	95	25 35.3	− 8
3	228 01.7	210 41.5	·· 21.1	325 55.2	·· 59.6	149 32.4	·· 48.5	11 16.8	·· 43.9	332 15.8	95	·25 36.1	− 7
4	243 04.1	225 41.1	22.3	340 56.5	59.7	164 34.5	48.5	26 19.4	43.9	346 44.3	95	25 36.8	− 5
5	258 06.6	240 40.7	23.6	355 57.7	22 59.9	179 36.6	48.6	41 22.0	43.8	1 12.8	95	25 37.3	− 5
6	273 09.1	255 40.4	+ 6 24.8	10 59.0	−23 00.0	194 38.7	+22 48.6	56 24.6	−11 43.8	15 41.3	94	−25 37.8	− 3
7	288 11.5	270 40.0	26.1	26 00.2	00.1	209 40.8	48.6	71 27.2	43.7	30 09.7	93	25 38.1	− 1
8	303 14.0	285 39.6	27.3	41 01.5	00.2	224 42.9	48.7	86 29.8	43.7	44 38.0	94	25 38.2	− 1
9	318 16.5	300 39.2	·· 28.6	56 02.7	·· 00.3	239 45.1	·· 48.7	101 32.4	·· 43.6	59 06.4	93	·25 38.3	+ 1
10	333 18.9	315 38.8	29.8	71 03.9	00.5	254 47.2	48.7	116 35.0	43.6	73 34.7	93	25 38.2	+ 3
11	348 21.4	330 38.4	31.1	86 05.2	00.6	269 49.3	48.7	131 37.6	43.5	88 03.0	93	25 37.9	+ 3
12	3 23.9	345 38.0	+ 6 32.3	101 06.4	−23 00.7	284 51.4	+22 48.8	146 40.2	−11 43.5	102 31.3	92	−25 37.6	+ 5
13	18 26.3	0 37.6	33.6	116 07.7	00.8	299 53.5	48.8	161 42.8	43.4	116 59.5	92	25 37.1	+ 7
14	33 28.8	15 37.2	34.8	131 08.9	00.9	314 55.6	48.8	176 45.4	43.4	131 27.7	92	25 36.4	+ 7
15	48 31.2	30 36.8	·· 36.0	146 10.2	·· 01.0	329 57.7	·· 48.9	191 48.0	·· 43.3	145 55.9	91	·25 35.7	+ 9
16	63 33.7	45 36.5	37.3	161 11.4	01.2	344 59.9	48.9	206 50.6	43.2	160 24.0	92	25 34.8	+ 11
17	78 36.2	60 36.1	38.5	176 12.7	01.3	0 02.0	48.9	221 53.2	43.2	174 52.2	91	25 33.7	+ 11
18	93 38.6	75 35.7	+ 6 39.8	191 13.9	−23 01.4	15 04.1	+22 49.0	236 55.8	−11 43.1	189 20.3	91	−25 32.6	+ 13
19	108 41.1	90 35.3	41.0	206 15.2	01.5	30 06.2	49.0	251 58.4	43.1	203 48.4	90	25 31.3	+ 15
20	123 43.6	105 34.9	42.3	221 16.4	01.6	45 08.3	49.0	267 01.0	43.0	218 16.4	91	25 29.8	+ 15
21	138 46.0	120 34.5	·· 43.5	236 17.7	·· 01.7	60 10.4	·· 49.1	282 03.6	·· 43.0	232 44.5	90	·25 28.3	+ 18
22	153 48.5	135 34.1	44.8	251 18.9	01.8	75 12.5	49.1	297 06.2	42.9	247 12.5	90	25 26.5	+ 18
23	168 51.0	150 33.7	46.0	266 20.2	02.0	90 14.7	49.1	312 08.8	42.9	261 40.5	90	25 24.7	+ 20
27 0	183 53.4	165 33.3	+ 6 47.2	281 21.4	−23 02.1	105 16.8	+22 49.2	327 11.4	−11 42.8	276 08.5	90	−25 22.7	+ 21
1	198 55.9	180 32.9	48.5	296 22.7	02.2	120 18.9	49.2	342 14.0	42.8	290 36.5	90	25 20.6	+ 23
2	213 58.4	195 32.5	49.7	311 23.9	02.3	135 21.0	49.2	357 16.6	42.7	305 04.5	89	25 18.3	+ 23
3	229 00.8	210 32.1	·· 51.0	326 25.2	·· 02.4	150 23.1	·· 49.3	12 19.2	·· 42.7	319 32.4	90	·25 16.0	+ 26
4	244 03.3	225 31.7	52.2	341 26.4	02.5	165 25.2	49.3	27 21.8	42.6	334 00.4	89	25 13.4	+ 26
5	259 05.7	240 31.3	53.5	356 27.7	02.7	180 27.3	49.3	42 24.4	42.6	348 28.3	89	25 10.8	+ 28
6	274 08.2	255 31.0	+ 6 54.7	11 28.9	−23 02.8	195 29.4	+22 49.4	57 27.0	−11 42.5	2 56.2	89	−25 08.0	+ 30
7	289 10.7	270 30.6	55.9	26 30.2	02.9	210 31.5	49.4	72 29.6	42.5	17 24.1	89	25 05.0	+ 30
8	304 13.1	285 30.2	57.2	41 31.4	03.0	225 33.7	49.4	87 32.2	42.4	31 52.0	89	25 02.0	+ 32
9	319 15.6	300 29.8	·· 58.4	56 32.7	·· 03.1	240 35.8	·· 49.4	102 34.9	·· 42.4	46 19.9	89	·24 58.8	+ 34
10	334 18.1	315 29.4	6 59.7	71 33.9	03.2	255 37.9	49.5	117 37.5	42.3	60 47.8	88	24 55.4	+ 35
11	349 20.5	330 29.0	7 00.9	86 35.2	03.3	270 40.0	49.5	132 40.1	42.3	75 15.6	89	24 51.9	+ 36
12	4 23.0	345 28.6	+ 7 02.1	101 36.4	−23 03.4	285 42.1	+22 49.5	147 42.7	−11 42.2	89 43.5	89	−24 48.3	+ 38
13	19 25.5	0 28.2	03.4	116 37.7	03.6	300 44.2	49.6	162 45.3	42.2	104 11.4	88	24 44.5	+ 38
14	34 27.9	15 27.8	04.6	131 38.9	03.7	315 46.3	49.6	177 47.9	42.1	118 39.2	89	24 40.7	+ 41
15	49 30.4	30 27.4	·· 05.9	146 40.2	·· 03.8	330 48.4	·· 49.6	192 50.5	·· 42.1	133 07.1	88	·24 36.6	+ 41
16	64 32.8	45 27.0	07.1	161 41.5	03.9	345 50.5	49.7	207 53.1	42.0	147 34.9	89	24 32.5	+ 43
17	79 35.3	60 26.6	08.3	176 42.7	04.0	0 52.6	49.7	222 55.7	42.0	162 02.8	88	24 28.2	+ 45
18	94 37.8	75 26.2	+ 7 09.6	191 44.0	−23 04.1	15 54.7	+22 49.7	237 58.3	−11 41.9	176 30.6	89	−24 23.7	+ 46
19	109 40.2	90 25.8	10.8	206 45.2	04.2	30 56.8	49.8	253 00.9	41.8	190 58.5	88	24 19.1	+ 47
20	124 42.7	105 25.4	12.0	221 46.5	04.4	45 59.0	49.8	268 03.5	41.8	205 26.3	89	24 14.4	+ 48
21	139 45.2	120 25.0	·· 13.3	236 47.7	·· 04.5	61 01.1	·· 49.8	283 06.1	·· 41.7	219 54.2	88	·24 09.6	+ 50
22	154 47.6	135 24.6	14.5	251 49.0	04.6	76 03.2	49.9	298 08.7	41.7	234 22.0	89	24 04.6	+ 51
23	169 50.1	150 24.2	15.8	266 50.3	04.7	91 05.3	49.9	313 11.3	41.6	248 49.9	89	23 59.5	+ 53
28 0	184 52.6	165 23.8	+ 7 17.0	281 51.5	−23 04.8	106 07.4	+22 49.9	328 13.9	−11 41.6	263 17.8	88	−23 54.2	+ 54
1	199 55.0	180 23.4	18.2	296 52.8	04.9	121 09.5	50.0	343 16.5	41.5	277 45.6	89	23 48.8	+ 55
2	214 57.5	195 23.0	19.5	311 54.0	05.0	136 11.6	50.0	358 19.1	41.5	292 13.5	89	23 43.3	+ 57
3	230 00.0	210 22.6	·· 20.7	326 55.3	·· 05.1	151 13.7	·· 50.0	13 21.7	·· 41.4	306 41.4	89	·23 37.6	+ 58
4	245 02.4	225 22.2	21.9	341 56.6	05.2	166 15.8	50.1	28 24.3	41.4	321 09.3	89	23 31.8	+ 59
5	260 04.9	240 21.8	23.2	356 57.8	05.4	181 17.9	50.1	43 26.9	41.3	335 37.2	89	23 25.9	+ 61
6	275 07.3	255 21.4	+ 7 24.4	11 59.1	−23 05.5	196 20.0	+22 50.1	58 29.5	−11 41.3	350 05.1	89	−23 19.8	+ 62
7	290 09.8	270 21.0	25.6	27 00.4	05.6	211 22.1	50.1	73 32.1	41.2	4 33.0	89	23 13.6	+ 63
8	305 12.3	285 20.6	26.9	42 01.6	05.7	226 24.2	50.2	88 34.7	41.2	19 00.9	89	23 07.3	+ 65
9	320 14.7	300 20.2	·· 28.1	57 02.9	·· 05.8	241 26.3	·· 50.2	103 37.3	·· 41.1	33 28.8	89	·23 00.8	+ 66
10	335 17.2	315 19.8	29.3	72 04.1	05.9	256 28.4	50.2	118 39.9	41.1	47 56.7	90	22 54.2	+ 67
11	350 19.7	330 19.4	30.6	87 05.4	06.0	271 30.5	50.3	133 42.6	41.0	62 24.7	90	22 47.5	+ 69
12	5 22.1	345 19.0	+ 7 31.8	102 06.7	−23 06.1	286 32.6	+22 50.3	148 45.2	−11 41.0	76 52.7	89	−22 40.6	+ 70
13	20 24.6	0 18.6	33.0	117 07.9	06.2	301 34.7	50.3	163 47.8	40.9	91 20.6	90	22 33.6	+ 71
14	35 27.1	15 18.2	34.3	132 09.2	06.4	316 36.8	50.4	178 50.4	40.8	105 48.6	90	22 26.5	+ 73
15	50 29.5	30 17.8	·· 35.5	147 10.5	·· 06.5	331 38.9	·· 50.4	193 53.0	·· 40.8	120 16.6	90	·22 19.2	+ 74
16	65 32.0	45 17.4	36.7	162 11.7	06.6	346 41.0	50.4	208 55.6	40.7	134 44.6	91	22 11.8	+ 75
17	80 34.5	60 17.0	38.0	177 13.0	06.7	1 43.1	50.5	223 58.2	40.7	149 12.7	90	22 04.3	+ 76
18	95 36.9	75 16.6	+ 7 39.2	192 14.3	−23 06.8	16 45.2	+22 50.5	239 00.8	−11 40.6	163 40.7	91	−21 56.7	+ 78
19	110 39.4	90 16.2	40.4	207 15.5	06.9	31 47.3	50.5	254 03.4	40.6	178 08.8	90	21 48.9	+ 79
20	125 41.8	105 15.8	41.7	222 16.8	07.0	46 49.4	50.6	269 06.0	40.5	192 36.8	91	21 41.0	+ 81
21	140 44.3	120 15.4	·· 42.9	237 18.1	·· 07.1	61 51.5	·· 50.6	284 08.6	·· 40.5	207 04.9	91	·21 32.9	+ 82
22	155 46.8	135 15.0	44.1	252 19.3	07.2	76 53.6	50.6	299 11.2	40.4	221 33.0	92	21 24.7	+ 83
23	170 49.2	150 14.6	45.4	267 20.6	07.3	91 55.7	50.7	314 13.8	40.4	236 01.2	91	21 16.4	+ 84
24	185 51.7	165 14.2	+ 7 46.6	282 21.9	−23 07.5	106 57.8	+22 50.7	329 16.4	−11 40.3	250 29.3	92	−21 08.0	+ 85
code	–	− 4	+ 13	+ 13	− 2	+ 21	+ 1	+ 26	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
26 0	178 30.3	+ 1 54.4
1	193 30.5	55.4
2	208 30.7	56.3
3	223 30.9 ••	57.3
4	238 31.1	58.3
5	253 31.3	1 59.3
6	268 31.4	+ 2 00.3
7	283 31.6	01.3
8	298 31.8	02.2
9	313 32.0 ••	03.2
10	328 32.2	04.2
11	343 32.4	05.2
12	358 32.6	+ 2 06.2
13	13 32.8	07.1
14	28 33.0	08.1
15	43 33.2 ••	09.1
16	58 33.3	10.1
17	73 33.5	11.1
18	88 33.7	+ 2 12.0
19	103 33.9	13.0
20	118 34.1	14.0
21	133 34.3 ••	15.0
22	148 34.5	16.0
23	163 34.7	16.9
27 0	178 34.9	+ 2 17.9
1	193 35.1	18.9
2	208 35.3	19.9
3	223 35.4 ••	20.9
4	238 35.6	21.8
5	253 35.8	22.8
6	268 36.0	+ 2 23.8
7	283 36.2	24.8
8	298 36.4	25.8
9	313 36.6 ••	26.7
10	328 36.8	27.7
11	343 37.0	28.7
12	358 37.2	+ 2 29.7
13	13 37.4	30.7
14	28 37.5	31.6
15	43 37.7 ••	32.6
16	58 37.9	33.6
17	73 38.1	34.6
18	88 38.3	+ 2 35.6
19	103 38.5	36.5
20	118 38.7	37.5
21	133 38.9 ••	38.5
22	148 39.1	39.5
23	163 39.3	40.4
28 0	178 39.4	+ 2 41.4
1	193 39.6	42.4
2	208 39.8	43.4
3	223 40.0 ••	44.4
4	238 40.2	45.3
5	253 40.4	46.3
6	268 40.6	+ 2 47.3
7	283 40.8	48.3
8	298 41.0	49.2
9	313 41.2 ••	50.2
10	328 41.3	51.2
11	343 41.5	52.2
12	358 41.7	+ 2 53.2
13	13 41.9	54.1
14	28 42.1	55.1
15	43 42.3 ••	56.1
16	58 42.5	57.1
17	73 42.7	58.0
18	88 42.9	+ 2 59.0
19	103 43.1	3 00.0
20	118 43.3	01.0
21	133 43.4 ••	01.9
22	148 43.6	02.9
23	163 43.8	03.9
24	178 44.0	+ 3 04.9
code	—	+ 10

No.	STARS Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 52.2	−40 29.3
5	Achernar	336 00.1	−57 28.1
30	Acrux	173 58.6	−62 50.9
19	Adhara	255 47.4	−28 54.7
10	Aldebaran	291 40.5	+16 25.2
32	Alioth	166 58.8	+56 12.3
34	Alkaid	153 33.2	+49 32.2
55	Al Na'ir	28 39.6	−47 10.9
15	Alnilam	276 31.5	− 1 13.8
25	Alphard	218 39.5	− 8 27.8
41	Alphecca	126 48.3	+26 51.7
1	Alpheratz	358 29.9	+28 50.2
51	Altair	62 51.6	+ 8 44.6
2	Ankaa	353 59.7	−42 33.2
42	Antares	113 20.6	−26 20.0
37	Arcturus	146 35.9	+19 24.9
43	Atria	109 02.2	−68 56.7
22	Avior	234 36.0	−59 22.0
13	Bellatrix	279 19.7	+ 6 18.6
16	Betelg'se	271 49.4	+ 7 24.0
17	Canopus	264 15.9	−52 40.5
12	Capella	281 40.2	+45 57.4
53	Deneb	50 02.1	+45 06.7
28	Denebola	183 18.5	+14 49.5
4	Diphda	349 40.7	−18 14.3
27	Dubhe	194 45.2	+61 59.9
14	Elnath	279 08.9	+28 34.3
47	Eltanin	91 06.7	+51 29.2
54	Enif	34 31.0	+ 9 39.7
56	Fomalhaut	16 13.1	−29 51.9
31	Gacrux	172 50.1	−56 51.6
29	Gienah	176 37.7	−17 17.5
35	Hadar	149 50.6	−60 09.3
6	Hamal	328 51.3	+23 14.9
48	Kaus Aust.	84 42.7	−34 24.5
40	Kochab	137 16.7	+74 20.2
57	Markab	14 22.9	+14 57.4
8	Menkar	315 01.7	+ 3 54.7
36	Menkent	148 59.7	−36 08.9
24	Miapl'dus	221 48.9	−69 32.0
9	Mirfak	309 44.4	+49 42.2
50	Nunki	76 53.3	−26 21.3
52	Peacock	54 29.2	−56 52.9
21	Pollux	244 21.8	+28 08.3
20	Procyon	245 46.1	+ 5 20.5
46	R'alhague	96 47.6	+12 35.2
26	Regulus	208 30.4	+12 11.3
11	Rigel	281 54.8	− 8 15.3
38	Rigil Kent.	140 52.1	−60 39.0
44	Sabik	103 03.4	−15 40.3
3	Schedar	350 32.0	+56 17.3
45	Shaula	97 22.1	−37 04.3
18	Sirius	259 12.8	−16 39.3
33	Spica	159 17.8	−10 55.6
23	Suhail	223 24.9	−43 15.1
49	Vega	81 09.0	+38 44.1
39	Zub'g'bi	137 54.4	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 26	27	28	29
N °	h m	h m	h m	h m	h m	h m
72	5 25	////	■	■	■	■
70	5 29	////	■	■	■	■
68	5 32	1 37	■	■	■	5 58
66	5 35	2 14	■	■	5 47	5 17
64	5 38	2 40	4 18	4 48	4 51	4 49
62	5 40	2 58	3 11	3 56	4 17	4 28
60	5 42	3 13	2 36	3 23	3 53	4 10
58	5 44	3 26	2 11	2 59	3 33	3 55
56	5 45	3 36	1 51	2 40	3 17	3 43
54	5 47	3 45	1 34	2 24	3 03	3 31
52	5 48	3 53	1 20	2 10	2 50	3 22
50	5 49	3 59	1 07	1 58	2 39	3 13
45	5 51	4 13	0 41	1 33	2 17	2 54
40	5 53	4 23	0 21	1 12	1 58	2 39
35	5 55	4 31	0 04	0 56	1 43	2 26
30	5 56	4 37	24 41	0 41	1 30	2 14
20	5 58	4 45	24 16	0 16	1 07	1 55
10	6 00	4 51	23 55	24 47	0 47	1 38
0	6 02	4 54	23 35	24 28	0 28	1 22
10	6 04	4 54	23 15	24 10	0 10	1 05
20	6 05	4 52	22 54	23 50	24 48	0 48
30	6 07	4 48	22 29	23 27	24 28	0 28
35	6 08	4 44	22 15	23 13	24 17	0 17
40	6 09	4 38	21 58	22 58	24 03	0 03
45	6 11	4 31	21 38	22 39	23 47	25 01
50	6 12	4 22	21 12	22 16	23 28	24 46
52	6 13	4 18	21 00	22 04	23 18	24 39
54	6 13	4 13	20 46	21 52	23 08	24 31
56	6 14	4 06	20 29	21 37	22 56	24 22
58	6 15	4 00	20 10	21 19	22 42	24 12
60	6 16	3 51	19 45	20 58	22 26	24 01
S						

Lat.	Sunset	Twlt. ends	Moonset 26	27	28	29
N °	h m	h m	h m	h m	h m	h m
72	18 49	////	■	■	■	■
70	18 44	////	■	■	■	■
68	18 41	22 48	■	■	■	9 25
66	18 38	22 06	■	■	7 44	10 05
64	18 35	21 39	5 32	6 51	8 40	10 32
62	18 33	21 19	6 38	7 44	9 13	10 53
60	18 31	21 04	7 13	8 16	9 37	11 10
58	18 29	20 51	7 39	8 40	9 57	11 24
56	18 27	20 39	7 59	8 59	10 13	11 36
54	18 26	20 30	8 16	9 15	10 26	11 46
52	18 24	20 22	8 30	9 29	10 38	11 56
50	18 23	20 15	8 42	9 41	10 49	12 04
45	18 21	20 01	9 08	10 05	11 11	12 22
40	18 19	19 51	9 29	10 25	11 28	12 36
35	18 17	19 42	9 46	10 42	11 43	12 48
30	18 15	19 35	10 01	10 56	11 56	12 59
20	18 13	19 27	10 26	11 20	12 18	13 17
10	18 11	19 21	10 47	11 41	12 36	13 32
0	18 09	19 18	11 08	12 01	12 54	13 47
10	18 07	19 17	11 28	12 20	13 11	14 01
20	18 05	19 18	11 49	12 41	13 30	14 16
30	18 03	19 22	12 14	13 05	13 51	14 34
35	18 02	19 26	12 29	13 18	14 03	14 44
40	18 01	19 31	12 46	13 35	14 18	14 55
45	18 00	19 38	13 06	13 54	14 34	15 09
50	17 58	19 46	13 32	14 18	14 55	15 25
52	17 57	19 50	13 44	14 29	15 05	15 32
54	17 57	19 56	13 58	14 42	15 16	15 41
56	17 56	20 01	14 15	14 57	15 28	15 50
58	17 55	20 08	14 34	15 15	15 42	16 01
60	17 54	20 16	14 59	15 37	15 59	16 13
S						

GMT	Equation of Time (App.—Mean) 26	27	28
h	m s	m s	m s
0	− 5 59.2	− 5 40.9	− 5 22.6
6	− 5 54.6	− 5 36.3	− 5 18.0
12	− 5 50.0	− 5 31.7	− 5 13.5
18	− 5 45.5	− 5 27.2	− 5 08.9
24	− 5 40.9	− 5 22.6	− 5 04.3

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
26	4 55	12 58	5 16	17 00	2 15
27	5 48	12 58	5 14	16 57	2 11
28	6 41	12 59	5 12	16 53	2 07
29	7 34	12 59	5 10	16 50	2 03

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.4	0.1	0.1
30			
	0.4	0.1	0.1
45			
	0.4	0.1	0.1
60			
	0.4	0.0	0.1
75			
	0.4	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	26	27	28
°	′	′	′
0			
	13.5	14.4	15.4
4			
	13.5	14.4	15.4
8			
	13.5	14.4	15.4
12			
	13.6	14.4	15.4
16			
	13.6	14.4	15.4
20			
	13.6	14.5	15.4
24			
	13.7	14.5	15.4
28			
	13.7	14.5	15.4
32			
	13.8	14.6	15.4
36			
	13.9	14.6	15.4
40			
	13.9	14.6	15.4
44			
	14.0	14.7	15.5
48			
	14.1	14.7	15.5
52			
	14.2	14.8	15.5
56			
	14.3	14.8	15.5
60			
	14.4	14.9	15.5
64			
	14.5	14.9	15.5
68			
	14.6	15.0	15.5
72			
	14.7	15.1	15.5
76			
	14.8	15.1	15.5
80			
	14.9	15.2	15.5
84			
	15.0	15.2	15.5
88			
	15.1	15.3	15.5
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	26	27	28
°	′	′	′
0			
	16.7	16.2	15.6
4			
	16.7	16.2	15.6
8			
	16.7	16.2	15.6
12			
	16.7	16.2	15.6
16			
	16.6	16.2	15.6
20			
	16.6	16.1	15.6
24			
	16.6	16.1	15.6
28			
	16.5	16.1	15.6
32			
	16.4	16.1	15.6
36			
	16.4	16.0	15.6
40			
	16.3	16.0	15.6
44			
	16.2	15.9	15.6
48			
	16.1	15.9	15.6
52			
	16.1	15.8	15.6
56			
	16.0	15.8	15.6
60			
	15.9	15.7	15.6
64			
	15.8	15.7	15.6
68			
	15.7	15.6	15.6
72			
	15.6	15.6	15.6
76			
	15.4	15.5	15.5
80			
	15.3	15.4	15.5
84			
	15.2	15.4	15.5
88			
	15.1	15.3	15.5
90			

Subtract from table, back cover

Last Quarter 27

GMT	♈ GHA	VENUS −3.4 GHA	Dec.	MARS 0.2 GHA	Dec.	JUPITER −1.7 GHA	Dec.	SATURN 0.5 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
29 0	185 51.7	165 14.2	+ 7 46.6	282 21.9	−23 07.5	106 57.8	+22 50.7	329 16.4	−11 40.3	250 29.3	92	−21 08.0	+ 85
1	200 54.2	180 13.8	47.8	297 23.1	07.6	121 59.9	50.7	344 19.0	40.3	264 57.5	92	20 59.5	+ 87
2	215 56.6	195 13.4	49.0	312 24.4	07.7	137 02.0	50.8	359 21.7	40.2	279 25.7	92	20 50.8	+ 88
3	230 59.1	210 13.0	·· 50.3	327 25.7	·· 07.8	152 04.1	·· 50.8	14 24.3	·· 40.2	293 53.9	92	·20 42.0	+ 89
4	246 01.6	225 12.6	51.5	342 27.0	07.9	167 06.2	50.8	29 26.9	40.1	308 22.1	92	20 33.1	+ 91
5	261 04.0	240 12.2	52.7	357 28.2	08.0	182 08.3	50.8	44 29.5	40.0	322 50.3	93	20 24.0	+ 92
6	276 06.5	255 11.8	+ 7 54.0	12 29.5	−23 08.1	197 10.4	+22 50.9	59 32.1	−11 40.0	337 18.6	92	−20 14.8	+ 93
7	291 09.0	270 11.4	55.2	27 30.8	08.2	212 12.5	50.9	74 34.7	39.9	351 46.8	93	20 05.5	+ 94
8	306 11.4	285 11.0	56.4	42 32.1	08.3	227 14.6	50.9	89 37.3	39.9	6 15.1	93	19 56.1	+ 96
9	321 13.9	300 10.6	·· 57.6	57 33.3	·· 08.4	242 16.7	·· 51.0	104 39.9	·· 39.8	20 43.4	94	·19 46.5	+ 96
10	336 16.3	315 10.2	7 58.9	72 34.6	08.5	257 18.8	51.0	119 42.5	39.8	35 11.8	93	19 36.9	+ 98
11	351 18.8	330 09.8	8 00.1	87 35.9	08.6	272 20.9	51.0	134 45.1	39.7	49 40.1	94	19 27.1	+ 99
12	6 21.3	345 09.4	+ 8 01.3	102 37.1	−23 08.8	287 23.0	+22 51.1	149 47.7	−11 39.7	64 08.5	94	−19 17.2	+101
13	21 23.7	0 09.0	02.5	117 38.4	08.9	302 25.1	51.1	164 50.3	39.6	78 36.9	94	19 07.1	+101
14	36 26.2	15 08.6	03.8	132 39.7	09.0	317 27.2	51.1	179 52.9	39.6	93 05.3	94	18 57.0	+103
15	51 28.7	30 08.1	·· 05.0	147 41.0	·· 09.1	332 29.3	·· 51.2	194 55.6	·· 39.5	107 33.7	95	·18 46.7	+104
16	66 31.1	45 07.7	06.2	162 42.2	09.2	347 31.4	51.2	209 58.2	39.5	122 02.2	95	18 36.3	+105
17	81 33.6	60 07.3	07.4	177 43.5	09.3	2 33.5	51.2	225 00.8	39.4	136 30.7	95	18 25.8	+106
18	96 36.1	75 06.9	+ 8 08.7	192 44.8	−23 09.4	17 35.6	+22 51.3	240 03.4	−11 39.4	150 59.2	95	−18 15.2	+107
19	111 38.5	90 06.5	09.9	207 46.1	09.5	32 37.7	51.3	255 06.0	39.3	165 27.7	95	18 04.5	+108
20	126 41.0	105 06.1	11.1	222 47.4	09.6	47 39.8	51.3	270 08.6	39.2	179 56.2	96	17 53.7	+110
21	141 43.4	120 05.7	·· 12.3	237 48.6	·· 09.7	62 41.9	·· 51.4	285 11.2	·· 39.2	194 24.8	96	·17 42.7	+111
22	156 45.9	135 05.3	13.6	252 49.9	09.8	77 44.0	51.4	300 13.8	39.1	208 53.4	96	17 31.6	+112
23	171 48.4	150 04.9	14.8	267 51.2	09.9	92 46.1	51.4	315 16.4	39.1	223 22.0	96	17 20.4	+113
30 0	186 50.8	165 04.5	+ 8 16.0	282 52.5	−23 10.0	107 48.2	+22 51.5	330 19.0	−11 39.0	237 50.6	96	−17 09.1	+114
1	201 53.3	180 04.1	17.2	297 53.8	10.1	122 50.2	51.5	345 21.6	39.0	252 19.2	97	16 57.7	+115
2	216 55.8	195 03.7	18.5	312 55.0	10.2	137 52.3	51.5	0 24.3	38.9	266 47.9	96	16 46.2	+116
3	231 58.2	210 03.3	·· 19.7	327 56.3	·· 10.4	152 54.4	·· 51.6	15 26.9	·· 38.9	281 16.5	97	·16 34.6	+117
4	247 00.7	225 02.8	20.9	342 57.6	10.5	167 56.5	51.6	30 29.5	38.8	295 45.2	98	16 22.9	+119
5	262 03.2	240 02.4	22.1	357 58.9	10.6	182 58.6	51.6	45 32.1	38.8	310 14.0	97	16 11.0	+119
6	277 05.6	255 02.0	+ 8 23.3	13 00.2	−23 10.7	198 00.7	+22 51.6	60 34.7	−11 38.7	324 42.7	97	−15 59.1	+120
7	292 08.1	270 01.6	24.6	28 01.4	10.8	213 02.8	51.7	75 37.3	38.7	339 11.4	98	15 47.1	+122
8	307 10.6	285 01.2	25.8	43 02.7	10.9	228 04.9	51.7	90 39.9	38.6	353 40.2	98	15 34.9	+122
9	322 13.0	300 00.8	·· 27.0	58 04.0	·· 11.0	243 07.0	·· 51.7	105 42.5	·· 38.5	8 09.0	98	·15 22.7	+124
10	337 15.5	315 00.4	28.2	73 05.3	11.1	258 09.1	51.8	120 45.1	38.5	22 37.8	98	15 10.3	+125
11	352 17.9	330 00.0	29.4	88 06.6	11.2	273 11.2	51.8	135 47.7	38.4	37 06.6	99	14 57.8	+125
12	7 20.4	344 59.6	+ 8 30.6	103 07.9	−23 11.3	288 13.3	+22 51.8	150 50.4	−11 38.4	51 35.5	98	−14 45.3	+127
13	22 22.9	359 59.1	31.9	118 09.2	11.4	303 15.4	51.9	165 53.0	38.3	66 04.3	99	14 32.6	+127
14	37 25.3	14 58.7	33.1	133 10.4	11.5	318 17.4	51.9	180 55.6	38.3	80 33.2	99	14 19.9	+129
15	52 27.8	29 58.3	·· 34.3	148 11.7	·· 11.6	333 19.5	·· 51.9	195 58.2	·· 38.2	95 02.1	99	·14 07.0	+129
16	67 30.3	44 57.9	35.5	163 13.0	11.7	348 21.6	52.0	211 00.8	38.2	109 31.0	99	13 54.1	+130
17	82 32.7	59 57.5	36.7	178 14.3	11.8	3 23.7	52.0	226 03.4	38.1	123 59.9	100	13 41.1	+132
18	97 35.2	74 57.1	+ 8 38.0	193 15.6	−23 11.9	18 25.8	+22 52.0	241 06.0	−11 38.1	138 28.9	99	−13 27.9	+132
19	112 37.7	89 56.7	39.2	208 16.9	12.0	33 27.9	52.1	256 08.6	38.0	152 57.8	100	13 14.7	+133
20	127 40.1	104 56.3	40.4	223 18.2	12.1	48 30.0	52.1	271 11.2	37.9	167 26.8	99	13 01.4	+134
21	142 42.6	119 55.8	·· 41.6	238 19.5	·· 12.2	63 32.1	·· 52.1	286 13.9	·· 37.9	181 55.7	100	·12 48.0	+135
22	157 45.1	134 55.4	42.8	253 20.8	12.3	78 34.2	52.2	301 16.5	37.8	196 24.7	100	12 34.5	+136
23	172 47.5	149 55.0	44.0	268 22.0	12.4	93 36.2	52.2	316 19.1	37.8	210 53.7	100	12 20.9	+137
31 0	187 50.0	164 54.6	+ 8 45.2	283 23.3	−23 12.6	108 38.3	+22 52.2	331 21.7	−11 37.7	225 22.7	101	−12 07.2	+137
1	202 52.4	179 54.2	46.5	298 24.6	12.7	123 40.4	52.3	346 24.3	37.7	239 51.8	100	11 53.5	+139
2	217 54.9	194 53.8	47.7	313 25.9	12.8	138 42.5	52.3	1 26.9	37.6	254 20.8	100	11 39.6	+139
3	232 57.4	209 53.4	·· 48.9	328 27.2	·· 12.9	153 44.6	·· 52.3	16 29.5	·· 37.6	268 49.8	101	·11 25.7	+140
4	247 59.8	224 52.9	50.1	343 28.5	13.0	168 46.7	52.3	31 32.1	37.5	283 18.9	100	11 11.7	+141
5	263 02.3	239 52.5	51.3	358 29.8	13.1	183 48.8	52.4	46 34.8	37.5	297 47.9	101	10 57.6	+141
6	278 04.8	254 52.1	+ 8 52.5	13 31.1	−23 13.2	198 50.8	+22 52.4	61 37.4	−11 37.4	312 17.0	101	−10 43.5	+143
7	293 07.2	269 51.7	53.7	28 32.4	13.3	213 52.9	52.4	76 40.0	37.3	326 46.1	100	10 29.2	+143
8	308 09.7	284 51.3	54.9	43 33.7	13.4	228 55.0	52.5	91 42.6	37.3	341 15.1	101	10 14.9	+144
9	323 12.2	299 50.9	·· 56.2	58 35.0	·· 13.5	243 57.1	·· 52.5	106 45.2	·· 37.2	355 44.2	101	·10 00.5	+145
10	338 14.6	314 50.4	57.4	73 36.3	13.6	258 59.2	52.5	121 47.8	37.2	10 13.3	101	9 46.0	+145
11	353 17.1	329 50.0	58.6	88 37.6	13.7	274 01.3	52.6	136 50.4	37.1	24 42.4	101	9 31.5	+146
12	8 19.5	344 49.6	+ 8 59.8	103 38.9	−23 13.8	289 03.4	+22 52.6	151 53.1	−11 37.1	39 11.5	101	− 9 16.9	+147
13	23 22.0	359 49.2	9 01.0	118 40.2	13.9	304 05.4	52.6	166 55.7	37.0	53 40.6	101	9 02.2	+148
14	38 24.5	14 48.8	02.2	133 41.5	14.0	319 07.5	52.7	181 58.3	37.0	68 09.7	101	8 47.4	+148
15	53 26.9	29 48.3	·· 03.4	148 42.8	·· 14.1	334 09.6	·· 52.7	197 00.9	·· 36.9	82 38.8	101	· 8 32.6	+149
16	68 29.4	44 47.9	04.6	163 44.0	14.2	349 11.7	52.7	212 03.5	36.8	97 07.9	101	8 17.7	+149
17	83 31.9	59 47.5	05.8	178 45.3	14.3	4 13.8	52.8	227 06.1	36.8	111 37.0	101	8 02.8	+150
18	98 34.3	74 47.1	+ 9 07.0	193 46.6	−23 14.4	19 15.9	+22 52.8	242 08.7	−11 36.7	126 06.1	101	− 7 47.8	+151
19	113 36.8	89 46.7	08.2	208 47.9	14.5	34 17.9	52.8	257 11.3	36.7	140 35.2	101	7 32.7	+151
20	128 39.3	104 46.3	09.4	223 49.2	14.6	49 20.0	52.9	272 14.0	36.6	155 04.3	101	7 17.6	+152
21	143 41.7	119 45.8	·· 10.7	238 50.5	·· 14.7	64 22.1	·· 52.9	287 16.6	·· 36.6	169 33.4	101	· 7 02.4	+153
22	158 44.2	134 45.4	11.9	253 51.8	14.8	79 24.2	52.9	302 19.2	36.5	184 02.5	101	6 47.1	+153
23	173 46.7	149 45.0	13.1	268 53.1	14.9	94 26.3	53.0	317 21.8	36.5	198 31.6	101	6 31.8	+154
24	188 49.1	164 44.6	+ 9 14.3	283 54.5	−23 15.0	109 28.4	+22 53.0	332 24.4	−11 36.4	213 00.7	101	− 6 16.4	+154
code	—	− 5	+ 13	+ 13	− 1	+ 21	+ 1	+ 26	+ 1				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
29 0	178 44.0	+ 3 04.9
1	193 44.2	05.9
2	208 44.4	06.8
3	223 44.6	•• 07.8
4	238 44.8	08.8
5	253 45.0	09.8
6	268 45.1	+ 3 10.7
7	283 45.3	11.7
8	298 45.5	12.7
9	313 45.7	•• 13.7
10	328 45.9	14.6
11	343 46.1	15.6
12	358 46.3	+ 3 16.6
13	13 46.5	17.6
14	28 46.7	18.5
15	43 46.9	•• 19.5
16	58 47.0	20.5
17	73 47.2	21.5
18	88 47.4	+ 3 22.4
19	103 47.6	23.4
20	118 47.8	24.4
21	133 48.0	•• 25.3
22	148 48.2	26.3
23	163 48.4	27.3
30 0	178 48.6	+ 3 28.3
1	193 48.8	29.2
2	208 48.9	30.2
3	223 49.1	•• 31.2
4	238 49.3	32.2
5	253 49.5	33.1
6	268 49.7	+ 3 34.1
7	283 49.9	35.1
8	298 50.1	36.1
9	313 50.3	•• 37.0
10	328 50.5	38.0
11	343 50.6	39.0
12	358 50.8	+ 3 39.9
13	13 51.0	40.9
14	28 51.2	41.9
15	43 51.4	•• 42.9
16	58 51.6	43.8
17	73 51.8	44.8
18	88 52.0	+ 3 45.8
19	103 52.2	46.7
20	118 52.3	47.7
21	133 52.5	•• 48.7
22	148 52.7	49.7
23	163 52.9	50.6
31 0	178 53.1	+ 3 51.6
1	193 53.3	52.6
2	208 53.5	53.5
3	223 53.7	•• 54.5
4	238 53.9	55.5
5	253 54.0	56.4
6	268 54.2	+ 3 57.4
7	283 54.4	58.4
8	298 54.6	3 59.4
9	313 54.8	• 4 00.3
10	328 55.0	01.3
11	343 55.2	02.3
12	358 55.4	+ 4 03.2
13	13 55.5	04.2
14	28 55.7	05.2
15	43 55.9	•• 06.1
16	58 56.1	07.1
17	73 56.3	08.1
18	88 56.5	+ 4 09.0
19	103 56.7	10.0
20	118 56.9	11.0
21	133 57.0	•• 11.9
22	148 57.2	12.9
23	163 57.4	13.9
24	178 57.6	+ 4 14.9
code	—	+ 10

No.	STARS Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 52.2	−40 29.3
5	Achernar	336 00.1	−57 28.1
30	Acrux	173 58.5	−62 50.9
19	Adhara	255 47.4	−28 54.7
10	Aldebaran	291 40.5	+16 25.2
32	Alioth	166 58.8	+56 12.3
34	Alkaid	153 33.2	+49 32.2
55	Al Na'ir	28 39.6	−47 10.9
15	Alnilam	276 31.5	− 1 13.8
25	Alphard	218 39.5	− 8 27.8
41	Alphecca	126 48.3	+26 51.7
1	Alpheratz	358 29.9	+28 50.2
51	Altair	62 51.6	+ 8 44.6
2	Ankaa	353 59.7	−42 33.2
42	Antares	113 20.6	−26 20.0
37	Arcturus	146 35.9	+19 24.9
43	Atria	109 02.1	−68 56.7
22	Avior	234 36.1	−59 22.0
13	Bellatrix	279 19.7	+ 6 18.6
16	Betelg'se	271 49.4	+ 7 24.0
17	Canopus	264 15.9	−52 40.5
12	Capella	281 40.3	+45 57.4
53	Deneb	50 02.0	+45 06.7
28	Denebola	183 18.5	+14 49.5
4	Diphda	349 40.7	−18 14.3
27	Dubhe	194 45.2	+61 59.9
14	Elnath	279 08.9	+28 34.3
47	Eltanin	91 06.7	+51 29.2
54	Enif	34 30.9	+ 9 39.7
56	Fomalhaut	16 13.1	−29 51.9
31	Gacrux	172 50.1	−56 51.6
29	Gienah	176 37.7	−17 17.5
35	Hadar	149 50.5	−60 09.3
6	Hamal	328 51.3	+23 14.9
48	Kaus Aust.	84 42.6	−34 24.5
40	Kochab	137 16.6	+74 20.2
57	Markab	14 22.9	+14 57.4
8	Menkar	315 01.7	+ 3 54.7
36	Menkent	148 59.7	−36 08.9
24	Miapl'dus	221 48.9	−69 32.0
9	Mirfak	309 44.4	+49 42.2
50	Nunki	76 53.3	−26 21.3
52	Peacock	54 29.2	−56 52.8
21	Pollux	244 21.8	+28 08.3
20	Procyon	245 46.1	+ 5 20.5
46	R'alhague	96 47.6	+12 35.2
26	Regulus	208 30.4	+12 11.3
11	Rigel	281 54.8	− 8 15.3
38	Rigil Kent.	140 52.1	−60 39.0
44	Sabik	103 03.3	−15 40.3
3	Schedar	350 32.0	+56 17.2
45	Shaula	97 22.1	−37 04.3
18	Sirius	259 12.8	−16 39.3
33	Spica	159 17.8	−10 55.6
23	Suhail	223 25.0	−43 15.1
49	Vega	81 09.0	+38 44.1
39	Zub'g'bi	137 54.3	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 29	Moonrise 30	Moonrise 31	Moonrise 1
N °	h m	h m	h m	h m	h m	h m
72	5 09	////	■	6 31	5 37	5 03
70	5 15	////	■	5 52	5 19	4 56
68	5 20	0 56	5 58	5 25	5 05	4 50
66	5 24	1 52	5 17	5 04	4 54	4 45
64	5 27	2 22	4 49	4 47	4 44	4 41
62	5 30	2 44	4 28	4 33	4 36	4 37
60	5 33	3 01	4 10	4 21	4 28	4 34
58	5 35	3 15	3 55	4 11	4 22	4 32
56	5 37	3 26	3 43	4 02	4 16	4 29
54	5 39	3 36	3 31	3 54	4 11	4 27
52	5 41	3 44	3 22	3 46	4 07	4 25
50	5 42	3 51	3 13	3 40	4 02	4 23
45	5 45	4 06	2 54	3 26	3 53	4 19
40	5 48	4 18	2 39	3 14	3 46	4 15
35	5 50	4 26	2 26	3 04	3 39	4 12
30	5 53	4 33	2 14	2 55	3 33	4 09
20	5 56	4 43	1 55	2 40	3 23	4 05
10	5 59	4 49	1 38	2 27	3 14	4 01
0	6 01	4 53	1 22	2 14	3 06	3 57
10	6 04	4 54	1 05	2 01	2 57	3 53
20	6 06	4 53	0 48	1 48	2 48	3 49
30	6 09	4 49	0 28	1 32	2 38	3 44
35	6 11	4 46	0 17	1 23	2 32	3 41
40	6 12	4 41	0 03	1 13	2 25	3 38
45	6 14	4 35	25 01	1 01	2 17	3 35
50	6 17	4 27	24 46	0 46	2 07	3 31
52	6 18	4 23	24 39	0 39	2 03	3 29
54	6 19	4 18	24 31	0 31	1 58	3 26
56	6 20	4 13	24 22	0 22	1 52	3 24
58	6 22	4 07	24 12	0 12	1 46	3 21
60	6 23	4 00	24 01	0 01	1 39	3 18
S						

Lat.	Sunset	Twlt. ends	Moonset 29	Moonset 30	Moonset 31	Moonset 1
N °	h m	h m	h m	h m	h m	h m
72	19 03	////	■	10 45	13 28	15 53
70	18 57	////	■	11 22	13 43	15 56
68	18 52	23 39	9 25	11 48	13 55	15 59
66	18 47	22 29	10 05	12 07	14 05	16 01
64	18 44	21 56	10 32	12 23	14 13	16 03
62	18 41	21 33	10 53	12 36	14 20	16 04
60	18 38	21 14	11 10	12 47	14 26	16 06
58	18 35	20 59	11 24	12 56	14 31	16 07
56	18 33	20 48	11 36	13 04	14 35	16 08
54	18 31	20 37	11 46	13 12	14 39	16 09
52	18 30	20 29	11 56	13 18	14 43	16 10
50	18 28	20 21	12 04	13 24	14 46	16 11
45	18 25	20 06	12 22	13 37	14 54	16 12
40	18 22	19 54	12 36	13 47	15 00	16 14
35	18 19	19 45	12 48	13 56	15 05	16 15
30	18 17	19 38	12 59	14 03	15 09	16 16
20	18 14	19 28	13 17	14 17	15 17	16 18
10	18 11	19 21	13 32	14 28	15 24	16 20
0	18 08	19 17	13 47	14 39	15 30	16 21
10	18 05	19 15	14 01	14 49	15 36	16 23
20	18 03	19 16	14 16	15 00	15 43	16 24
30	18 00	19 19	14 34	15 13	15 50	16 26
35	17 58	19 22	14 44	15 20	15 54	16 27
40	17 56	19 26	14 55	15 28	15 59	16 28
45	17 54	19 32	15 09	15 38	16 04	16 29
50	17 52	19 40	15 25	15 50	16 11	16 30
52	17 51	19 44	15 32	15 55	16 14	16 31
54	17 49	19 47	15 41	16 01	16 17	16 32
56	17 48	19 53	15 50	16 07	16 20	16 32
58	17 47	19 59	16 01	16 14	16 24	16 33
60	17 45	20 06	16 13	16 22	16 29	16 34
S						

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.3	0.1	0.1
30			
	0.3	0.1	0.1
45			
	0.3	0.1	0.1
60			
	0.3	0.0	0.1
75			
	0.3	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	29	30	31
°	′	′	′
0			
	16.6	17.8	19.0
4			
	16.6	17.8	19.0
8			
	16.6	17.8	18.9
12			
	16.5	17.8	18.9
16			
	16.5	17.8	18.9
20			
	16.5	17.7	18.8
24			
	16.5	17.7	18.7
28			
	16.5	17.6	18.6
32			
	16.4	17.5	18.5
36			
	16.4	17.5	18.4
40			
	16.4	17.4	18.3
44			
	16.3	17.3	18.2
48			
	16.3	17.2	18.0
52			
	16.2	17.1	17.9
56			
	16.2	17.0	17.7
60			
	16.1	16.9	17.6
64			
	16.1	16.8	17.4
68			
	16.0	16.7	17.2
72			
	16.0	16.5	17.0
76			
	15.9	16.4	16.8
80			
	15.9	16.3	16.7
84			
	15.8	16.2	16.5
88			
	15.8	16.1	16.3
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	29	30	31
°	′	′	′
0			
	15.0	14.2	13.6
4			
	15.0	14.3	13.6
8			
	15.0	14.3	13.6
12			
	15.0	14.3	13.7
16			
	15.0	14.3	13.7
20			
	15.0	14.4	13.8
24			
	15.0	14.4	13.9
28			
	15.1	14.5	13.9
32			
	15.1	14.5	14.0
36			
	15.1	14.6	14.2
40			
	15.2	14.7	14.3
44			
	15.2	14.8	14.4
48			
	15.3	14.9	14.5
52			
	15.3	15.0	14.7
56			
	15.3	15.1	14.9
60			
	15.4	15.2	15.0
64			
	15.4	15.3	15.2
68			
	15.5	15.4	15.4
72			
	15.5	15.5	15.5
76			
	15.6	15.7	15.7
80			
	15.7	15.8	15.9
84			
	15.7	15.9	16.1
88			
	15.8	16.0	16.2
90			

Subtract from table, back cover

GMT	Equation of Time (App.—Mean) 29	30	31
h	m s	m s	m s
0	− 5 04.3	− 4 46.1	− 4 28.0
6	− 4 59.8	− 4 41.6	− 4 23.5
12	− 4 55.2	− 4 37.1	− 4 18.9
18	− 4 50.7	− 4 32.5	− 4 14.4
24	− 4 46.1	− 4 28.0	− 4 09.9

GMT of Transit
Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
29	7 34	12 59	5 10	16 50	2 03
30	8 26	13 00	5 08	16 47	1 58
31	9 18	13 01	5 06	16 43	1 54
1	10 09	13 01	5 04	16 40	1 50

GMT	♈ GHA	VENUS −3.3 GHA	VENUS Dec.	MARS 0.1 GHA	MARS Dec.	JUPITER −1.7 GHA	JUPITER Dec.	SATURN 0.4 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
1 0	188 49.1	164 44.6	+ 9 14.3	283 54.5	−23 15.0	109 28.4	+22 53.0	332 24.4	−11 36.4	213 00.7	101	− 6 16.4	+154
1	203 51.6	179 44.1	15.5	298 55.8	15.1	124 30.4	53.0	347 27.0	36.3	227 29.8	100	6 01.0	+155
2	218 54.0	194 43.7	16.7	313 57.1	15.2	139 32.5	53.1	2 29.6	36.3	241 58.8	101	5 45.5	+155
3	233 56.5	209 43.3	·· 17.9	328 58.4	·· 15.3	154 34.6	·· 53.1	17 32.3	·· 36.2	256 27.9	100	· 5 30.0	+155
4	248 59.0	224 42.9	19.1	343 59.7	15.4	169 36.7	53.1	32 34.9	36.2	270 56.9	101	5 14.5	+157
5	264 01.4	239 42.5	20.3	359 01.0	15.5	184 38.8	53.1	47 37.5	36.1	285 26.0	100	4 58.8	+156
6	279 03.9	254 42.0	+ 9 21.5	14 02.3	−23 15.6	199 40.8	+22 53.2	62 40.1	−11 36.1	299 55.0	100	− 4 43.2	+157
7	294 06.4	269 41.6	22.7	29 03.6	15.7	214 42.9	53.2	77 42.7	36.0	314 24.0	100	4 27.5	+158
8	309 08.8	284 41.2	23.9	44 04.9	15.8	229 45.0	53.2	92 45.3	36.0	328 53.0	100	4 11.7	+158
9	324 11.3	299 40.8	·· 25.1	59 06.2	·· 15.9	244 47.1	·· 53.3	107 48.0	·· 35.9	343 22.0	100	· 3 55.9	+158
10	339 13.8	314 40.3	26.3	74 07.5	16.0	259 49.2	53.3	122 50.6	35.8	357 51.0	100	3 40.1	+158
11	354 16.2	329 39.9	27.5	89 08.8	16.1	274 51.2	53.3	137 53.2	35.8	12 20.0	99	3 24.3	+159
12	9 18.7	344 39.5	+ 9 28.7	104 10.1	−23 16.2	289 53.3	+22 53.4	152 55.8	−11 35.7	26 48.9	99	− 3 08.4	+160
13	24 21.1	359 39.1	29.9	119 11.4	16.3	304 55.4	53.4	167 58.4	35.7	41 17.8	99	2 52.4	+159
14	39 23.6	14 38.6	31.1	134 12.7	16.4	319 57.5	53.4	183 01.0	35.6	55 46.7	99	2 36.5	+160
15	54 26.1	29 38.2	·· 32.3	149 14.0	·· 16.5	334 59.6	·· 53.5	198 03.6	·· 35.6	70 15.6	99	· 2 20.5	+161
16	69 28.5	44 37.8	33.5	164 15.3	16.6	350 01.6	53.5	213 06.3	35.5	84 44.5	98	2 04.4	+160
17	84 31.0	59 37.4	34.7	179 16.7	16.7	5 03.7	53.5	228 08.9	35.5	99 13.3	98	1 48.4	+161
18	99 33.5	74 36.9	+ 9 35.9	194 18.0	−23 16.8	20 05.8	+22 53.6	243 11.5	−11 35.4	113 42.1	98	− 1 32.3	+161
19	114 35.9	89 36.5	37.1	209 19.3	16.9	35 07.9	53.6	258 14.1	35.3	128 10.9	98	1 16.2	+161
20	129 38.4	104 36.1	38.3	224 20.6	17.0	50 09.9	53.6	273 16.7	35.3	142 39.7	98	1 00.1	+161
21	144 40.9	119 35.7	·· 39.5	239 21.9	·· 17.1	65 12.0	·· 53.7	288 19.3	·· 35.2	157 08.5	97	· 0 44.0	+162
22	159 43.3	134 35.2	40.7	254 23.2	17.2	80 14.1	53.7	303 22.0	35.2	171 37.2	97	0 27.8	+162
23	174 45.8	149 34.8	41.9	269 24.5	17.3	95 16.2	53.7	318 24.6	35.1	186 05.9	96	− 0 11.6	+162
2 0	189 48.3	164 34.4	+ 9 43.1	284 25.8	−23 17.4	110 18.2	+22 53.8	333 27.2	−11 35.1	200 34.5	97	+ 0 04.6	+162
1	204 50.7	179 33.9	44.3	299 27.2	17.5	125 20.3	53.8	348 29.8	35.0	215 03.2	96	0 20.8	+162
2	219 53.2	194 33.5	45.5	314 28.5	17.6	140 22.4	53.8	3 32.4	35.0	229 31.8	96	0 37.0	+162
3	234 55.6	209 33.1	·· 46.7	329 29.8	·· 17.7	155 24.5	·· 53.9	18 35.0	·· 34.9	244 00.4	95	· 0 53.2	+162
4	249 58.1	224 32.7	47.9	344 31.1	17.8	170 26.5	53.9	33 37.7	34.8	258 28.9	95	1 09.4	+163
5	265 00.6	239 32.2	49.1	359 32.4	17.9	185 28.6	53.9	48 40.3	34.8	272 57.4	95	1 25.7	+162
6	280 03.0	254 31.8	+ 9 50.3	14 33.7	−23 18.0	200 30.7	+22 53.9	63 42.9	−11 34.7	287 25.9	94	+ 1 41.9	+163
7	295 05.5	269 31.4	51.5	29 35.1	18.1	215 32.8	54.0	78 45.5	34.7	301 54.3	94	1 58.2	+162
8	310 08.0	284 30.9	52.7	44 36.4	18.2	230 34.8	54.0	93 48.1	34.6	316 22.7	94	2 14.4	+162
9	325 10.4	299 30.5	·· 53.8	59 37.7	·· 18.3	245 36.9	·· 54.0	108 50.8	·· 34.6	330 51.1	94	· 2 30.6	+163
10	340 12.9	314 30.1	55.0	74 39.0	18.4	260 39.0	54.1	123 53.4	34.5	345 19.5	92	2 46.9	+162
11	355 15.4	329 29.6	56.2	89 40.3	18.5	275 41.1	54.1	138 56.0	34.5	359 47.7	93	3 03.1	+162
12	10 17.8	344 29.2	+ 9 57.4	104 41.6	−23 18.6	290 43.1	+22 54.1	153 58.6	−11 34.4	14 16.0	92	+ 3 19.3	+162
13	25 20.3	359 28.8	58.6	119 43.0	18.7	305 45.2	54.2	169 01.2	34.3	28 44.2	92	3 35.5	+162
14	40 22.8	14 28.4	9 59.8	134 44.3	18.8	320 47.3	54.2	184 03.8	34.3	43 12.4	91	3 51.7	+162
15	55 25.2	29 27.9	·10 01.0	149 45.6	·· 18.9	335 49.4	·· 54.2	199 06.5	·· 34.2	57 40.5	91	· 4 07.9	+162
16	70 27.7	44 27.5	02.2	164 46.9	19.0	350 51.4	54.3	214 09.1	34.2	72 08.6	90	4 24.1	+161
17	85 30.1	59 27.1	03.4	179 48.2	19.1	5 53.5	54.3	229 11.7	34.1	86 36.6	90	4 40.2	+162
18	100 32.6	74 26.6	+10 04.6	194 49.6	−23 19.1	20 55.6	+22 54.3	244 14.3	−11 34.1	101 04.6	90	+ 4 56.4	+161
19	115 35.1	89 26.2	05.7	209 50.9	19.2	35 57.6	54.4	259 16.9	34.0	115 32.6	89	5 12.5	+161
20	130 37.5	104 25.8	06.9	224 52.2	19.3	50 59.7	54.4	274 19.6	33.9	130 00.5	89	5 28.6	+160
21	145 40.0	119 25.3	·· 08.1	239 53.5	·· 19.4	66 01.8	·· 54.4	289 22.2	·· 33.9	144 28.4	88	· 5 44.6	+161
22	160 42.5	134 24.9	09.3	254 54.9	19.5	81 03.9	54.5	304 24.8	33.8	158 56.2	87	6 00.7	+160
23	175 44.9	149 24.4	10.5	269 56.2	19.6	96 05.9	54.5	319 27.4	33.8	173 23.9	87	6 16.7	+159
3 0	190 47.4	164 24.0	+10 11.7	284 57.5	−23 19.7	111 08.0	+22 54.5	334 30.0	−11 33.7	187 51.6	87	+ 6 32.6	+160
1	205 49.9	179 23.6	12.9	299 58.8	19.8	126 10.1	54.6	349 32.6	33.7	202 19.3	86	6 48.6	+159
2	220 52.3	194 23.1	14.1	315 00.2	19.9	141 12.1	54.6	4 35.3	33.6	216 46.9	86	7 04.5	+158
3	235 54.8	209 22.7	·· 15.2	330 01.5	·· 20.0	156 14.2	·· 54.6	19 37.9	·· 33.5	231 14.5	85	· 7 20.3	+159
4	250 57.2	224 22.3	16.4	345 02.8	20.1	171 16.3	54.6	34 40.5	33.5	245 42.0	84	7 36.2	+157
5	265 59.7	239 21.8	17.6	0 04.1	20.2	186 18.3	54.7	49 43.1	33.4	260 09.4	84	7 51.9	+158
6	281 02.2	254 21.4	+10 18.8	15 05.5	−23 20.3	201 20.4	+22 54.7	64 45.7	−11 33.4	274 36.8	83	+ 8 07.7	+157
7	296 04.6	269 21.0	20.0	30 06.8	20.4	216 22.5	54.7	79 48.4	33.3	289 04.1	83	8 23.4	+156
8	311 07.1	284 20.5	21.2	45 08.1	20.5	231 24.5	54.8	94 51.0	33.3	303 31.4	82	8 39.0	+156
9	326 09.6	299 20.1	·· 22.4	60 09.5	·· 20.6	246 26.6	·· 54.8	109 53.6	·· 33.2	317 58.6	82	· 8 54.6	+155
10	341 12.0	314 19.6	23.5	75 10.8	20.7	261 28.7	54.8	124 56.2	33.2	332 25.8	81	9 10.1	+155
11	356 14.5	329 19.2	24.7	90 12.1	20.8	276 30.7	54.9	139 58.8	33.1	346 52.9	80	9 25.6	+155
12	11 17.0	344 18.8	+10 25.9	105 13.5	−23 20.9	291 32.8	+22 54.9	155 01.5	−11 33.0	1 19.9	80	+ 9 41.1	+153
13	26 19.4	359 18.3	27.1	120 14.8	21.0	306 34.9	54.9	170 04.1	33.0	15 46.9	80	9 56.4	+153
14	41 21.9	14 17.9	28.3	135 16.1	21.1	321 36.9	55.0	185 06.7	32.9	30 13.9	78	10 11.7	+153
15	56 24.4	29 17.5	·· 29.4	150 17.5	·· 21.2	336 39.0	·· 55.0	200 09.3	·· 32.9	44 40.7	78	·10 27.0	+152
16	71 26.8	44 17.0	30.6	165 18.8	21.2	351 41.1	55.0	215 11.9	32.8	59 07.5	78	10 42.2	+151
17	86 29.3	59 16.6	31.8	180 20.1	21.3	6 43.1	55.1	230 14.6	32.8	73 34.3	77	10 57.3	+150
18	101 31.7	74 16.1	+10 33.0	195 21.5	−23 21.4	21 45.2	+22 55.1	245 17.2	−11 32.7	88 01.0	76	+11 12.3	+150
19	116 34.2	89 15.7	34.2	210 22.8	21.5	36 47.3	55.1	260 19.8	32.6	102 27.6	75	11 27.3	+149
20	131 36.7	104 15.2	35.3	225 24.1	21.6	51 49.3	55.2	275 22.4	32.6	116 54.1	75	11 42.2	+148
21	146 39.1	119 14.8	·· 36.5	240 25.5	·· 21.7	66 51.4	·· 55.2	290 25.1	·· 32.5	131 20.6	74	·11 57.0	+148
22	161 41.6	134 14.4	37.7	255 26.8	21.8	81 53.5	55.2	305 27.7	32.5	145 47.0	74	12 11.8	+146
23	176 44.1	149 13.9	38.9	270 28.1	21.9	96 55.5	55.3	320 30.3	32.4	160 13.4	73	12 26.4	+146
24	191 46.5	164 13.5	+10 40.0	285 29.5	−23 22.0	111 57.6	+22 55.3	335 32.9	−11 32.4	174 39.7	72	+12 41.0	+145
code	—	− 4	+ 12	+ 14	− 1	+ 21	+ 1	+ 26	+ 1				

GMT	SUN GHA	SUN Dec.
1 0	178 57.6	+ 4 14.9
1	193 57.8	15.8
2	208 58.0	16.8
3	223 58.2	•• 17.8
4	238 58.4	18.7
5	253 58.5	19.7
6	268 58.7	+ 4 20.7
7	283 58.9	21.6
8	298 59.1	22.6
9	313 59.3	•• 23.6
10	328 59.5	24.5
11	343 59.7	25.5
12	358 59.9	+ 4 26.5
13	14 00.0	27.4
14	29 00.2	28.4
15	44 00.4	•• 29.4
16	59 00.6	30.3
17	74 00.8	31.3
18	89 01.0	+ 4 32.2
19	104 01.2	33.2
20	119 01.3	34.2
21	134 01.5	•• 35.1
22	149 01.7	36.1
23	164 01.9	37.1
2 0	179 02.1	+ 4 38.0
1	194 02.3	39.0
2	209 02.5	40.0
3	224 02.7	•• 40.9
4	239 02.8	41.9
5	254 03.0	42.9
6	269 03.2	+ 4 43.8
7	284 03.4	44.8
8	299 03.6	45.7
9	314 03.8	•• 46.7
10	329 04.0	47.7
11	344 04.1	48.6
12	359 04.3	+ 4 49.6
13	14 04.5	50.6
14	29 04.7	51.5
15	44 04.9	•• 52.5
16	59 05.1	53.4
17	74 05.3	54.4
18	89 05.4	+ 4 55.4
19	104 05.6	56.3
20	119 05.8	57.3
21	134 06.0	•• 58.3
22	149 06.2	4 59.2
23	164 06.4	5 00.2
3 0	179 06.5	+ 5 01.1
1	194 06.7	02.1
2	209 06.9	03.1
3	224 07.1	•• 04.0
4	239 07.3	05.0
5	254 07.5	05.9
6	269 07.7	+ 5 06.9
7	284 07.8	07.9
8	299 08.0	08.8
9	314 08.2	•• 09.8
10	329 08.4	10.7
11	344 08.6	11.7
12	359 08.8	+ 5 12.7
13	14 08.9	13.6
14	29 09.1	14.6
15	44 09.3	•• 15.5
16	59 09.5	16.5
17	74 09.7	17.4
18	89 09.9	+ 5 18.4
19	104 10.0	19.4
20	119 10.2	20.3
21	134 10.4	•• 21.3
22	149 10.6	22.2
23	164 10.8	23.2
24	179 11.0	+ 5 24.1
code	—	+ 10

STARS No.	Name	SHA	Dec.
7	Acamar	315 52.3	−40 29.3
5	Achernar	336 00.1	−57 28.1
30	Acrux	173 58.5	−62 51.0
19	Adhara	255 47.4	−28 54.7
10	Aldebaran	291 40.5	+16 25.2
32	Alioth	166 58.8	+56 12.3
34	Alkaid	153 33.2	+49 32.2
55	Al Na'ir	28 39.6	−47 10.9
15	Alnilam	276 31.5	− 1 13.8
25	Alphard	218 39.5	− 8 27.8
41	Alphecca	126 48.3	+26 51.7
1	Alpheratz	358 29.9	+28 50.2
51	Altair	62 51.6	+ 8 44.6
2	Ankaa	353 59.7	−42 33.2
42	Antares	113 20.5	−26 20.0
37	Arcturus	146 35.9	+19 24.9
43	Atria	109 02.1	−68 56.7
22	Avior	234 36.1	−59 22.0
13	Bellatrix	279 19.7	+ 6 18.6
16	Betelg'se	271 49.4	+ 7 24.0
17	Canopus	264 15.9	−52 40.5
12	Capella	281 40.3	+45 57.4
53	Deneb	50 02.0	+45 06.7
28	Denebola	183 18.5	+14 49.5
4	Diphda	349 40.7	−18 14.3
27	Dubhe	194 45.2	+61 59.9
14	Elnath	279 08.9	+28 34.3
47	Eltanin	91 06.6	+51 29.2
54	Enif	34 30.9	+ 9 39.7
56	Fomalhaut	16 13.1	−29 51.9
31	Gacrux	172 50.0	−56 51.6
29	Gienah	176 37.7	−17 17.5
35	Hadar	149 50.5	−60 09.3
6	Hamal	328 51.3	+23 14.9
48	Kaus Aust.	84 42.6	−34 24.5
40	Kochab	137 16.6	+74 20.3
57	Markab	14 22.9	+14 57.4
8	Menkar	315 01.8	+ 3 54.7
36	Menkent	148 59.7	−36 08.9
24	Miapl'dus	221 48.9	−69 32.0
9	Mirfak	309 44.4	+49 42.2
50	Nunki	76 53.3	−26 21.3
52	Peacock	54 29.2	−56 52.8
21	Pollux	244 21.8	+28 08.3
20	Procyon	245 46.1	+ 5 20.5
46	R'alhague	96 47.5	+12 35.3
26	Regulus	208 30.4	+12 11.3
11	Rigel	281 54.8	− 8 15.3
38	Rigil Kent.	140 52.0	−60 39.0
44	Sabik	103 03.3	−15 40.3
3	Schedar	350 31.9	+56 17.2
45	Shaula	97 22.1	−37 04.3
18	Sirius	259 12.9	−16 39.3
33	Spica	159 17.8	−10 55.6
23	Suhail	223 25.0	−43 15.1
49	Vega	81 09.0	+38 44.1
39	Zub'g'bi	137 54.3	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 1	Moonrise 2	Moonrise 3	Moonrise 4
N 72	4 53	////	5 03	4 33	4 03	3 22
70	5 01	////	4 56	4 35	4 13	3 46
68	5 07	////	4 50	4 36	4 22	4 05
66	5 12	1 22	4 45	4 37	4 29	4 20
64	5 17	2 02	4 41	4 38	4 35	4 33
62	5 21	2 28	4 37	4 39	4 41	4 44
60	5 24	2 48	4 34	4 40	4 45	4 53
58	5 27	3 03	4 32	4 40	4 50	5 01
56	5 29	3 16	4 29	4 41	4 54	5 08
54	5 32	3 26	4 27	4 41	4 57	5 15
52	5 34	3 36	4 25	4 42	5 00	5 21
50	5 36	3 44	4 23	4 42	5 03	5 26
45	5 40	4 00	4 19	4 43	5 09	5 37
40	5 43	4 12	4 15	4 44	5 14	5 47
35	5 46	4 22	4 12	4 45	5 19	5 55
30	5 49	4 29	4 09	4 45	5 23	6 02
20	5 53	4 40	4 05	4 46	5 30	6 15
10	5 57	4 48	4 01	4 47	5 36	6 26
0	6 00	4 52	3 57	4 48	5 42	6 37
10	6 04	4 54	3 53	4 49	5 48	6 48
20	6 07	4 54	3 49	4 51	5 54	6 59
30	6 11	4 51	3 44	4 52	6 01	7 13
35	6 13	4 48	3 41	4 53	6 06	7 20
40	6 15	4 44	3 38	4 54	6 11	7 29
45	6 18	4 39	3 35	4 55	6 16	7 40
50	6 21	4 32	3 31	4 56	6 23	7 52
52	6 23	4 29	3 29	4 56	6 26	7 59
54	6 24	4 25	3 26	4 57	6 30	8 05
56	6 26	4 20	3 24	4 58	6 34	8 12
58	6 28	4 14	3 21	4 59	6 38	8 21
S 60	6 30	4 08	3 18	4 59	6 43	8 30

Lat.	Sunset	Twlt. ends	Moonset 1	Moonset 2	Moonset 3	Moonset 4
N 72	19 17	////	15 53	18 17	20 54	▭
70	19 09	////	15 56	18 09	20 32	23 20
68	19 03	////	15 59	18 03	20 15	22 40
66	18 57	22 59	16 01	17 59	20 02	22 13
64	18 52	22 14	16 03	17 55	19 50	21 52
62	18 49	21 47	16 04	17 51	19 41	21 35
60	18 45	21 26	16 06	17 48	19 33	21 21
58	18 42	21 10	16 07	17 45	19 26	21 09
56	18 39	20 56	16 08	17 43	19 20	20 59
54	18 37	20 45	16 09	17 41	19 14	20 50
52	18 35	20 36	16 10	17 39	19 10	20 42
50	18 33	20 28	16 11	17 37	19 05	20 35
45	18 28	20 10	16 12	17 33	18 56	20 19
40	18 25	19 58	16 14	17 30	18 48	20 07
35	18 22	19 48	16 15	17 27	18 41	19 56
30	18 19	19 40	16 16	17 25	18 35	19 47
20	18 15	19 29	16 18	17 20	18 25	19 31
10	18 11	19 21	16 20	17 17	18 16	19 17
0	18 07	19 16	16 21	17 13	18 07	19 04
10	18 04	19 14	16 23	17 10	17 59	18 51
20	18 00	19 13	16 24	17 06	17 50	18 38
30	17 56	19 15	16 26	17 02	17 40	18 22
35	17 54	19 18	16 27	17 00	17 34	18 13
40	17 51	19 21	16 28	16 57	17 28	18 03
45	17 49	19 26	16 29	16 54	17 20	17 51
50	17 45	19 32	16 30	16 50	17 11	17 37
52	17 44	19 36	16 31	16 48	17 07	17 30
54	17 42	19 40	16 32	16 46	17 03	17 22
56	17 40	19 44	16 32	16 44	16 58	17 14
58	17 38	19 49	16 33	16 42	16 52	17 05
S 60	17 36	19 56	16 34	16 39	16 46	16 54

GMT h	Equation of Time (App.—Mean) 1	2	3
0	− 4 09.9	− 3 52.0	− 3 34.2
6	− 4 05.4	− 3 47.5	− 3 29.7
12	− 4 01.0	− 3 43.1	− 3 25.3
18	− 3 56.5	− 3 38.6	− 3 20.9
24	− 3 52.0	− 3 34.2	− 3 16.5

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
1	10 09	13 01	5 04	16 40	1 50
2	11 01	13 02	5 02	16 37	1 46
3	11 55	13 03	5 00	16 33	1 42
4	12 51	13 04	4 58	16 30	1 38

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
0	0.3	0.1	0.1
30	0.3	0.1	0.1
45	0.3	0.1	0.1
60	0.3	0.0	0.1
75	0.3	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	1	2	3
0	20.0	20.8	21.1
4	20.0	20.7	21.1
8	20.0	20.7	21.1
12	19.9	20.6	21.0
16	19.8	20.6	20.9
20	19.8	20.5	20.8
24	19.6	20.4	20.7
28	19.5	20.2	20.6
32	19.4	20.1	20.4
36	19.3	19.9	20.2
40	19.1	19.7	20.0
44	18.9	19.5	19.8
48	18.8	19.3	19.6
52	18.6	19.1	19.3
56	18.4	18.8	19.1
60	18.1	18.6	18.8
64	17.9	18.3	18.5
68	17.7	18.1	18.3
72	17.5	17.8	18.0
76	17.2	17.5	17.7
80	17.0	17.2	17.4
84	16.7	17.0	17.1
88	16.6	16.7	16.8
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	1	2	3
0	13.0	12.6	12.4
4	13.0	12.6	12.4
8	13.1	12.6	12.4
12	13.1	12.7	12.5
16	13.2	12.8	12.6
20	13.3	12.9	12.7
24	13.4	13.0	12.8
28	13.5	13.1	12.9
32	13.6	13.3	13.2
36	13.7	13.4	13.3
40	13.9	13.6	13.5
44	14.1	13.8	13.7
48	14.3	14.0	13.9
52	14.4	14.3	14.2
56	14.6	14.5	14.4
60	14.9	14.7	14.7
64	15.1	15.0	15.0
68	15.3	15.3	15.2
72	15.5	15.5	15.5
76	15.8	15.8	15.8
80	16.0	16.1	16.1
84	16.3	16.4	16.4
88	16.4	16.6	16.7
90			

Subtract from table, back cover

New Moon 3

GMT	♈ GHA	VENUS −3.3 GHA	VENUS Dec.	MARS 0.0 GHA	MARS Dec.	JUPITER −1.7 GHA	JUPITER Dec.	SATURN 0.4 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
4 0	191 46.5	164 13.5	+10 40.0	285 29.5	−23 22.0	111 57.6	+22 55.3	335 32.9	−11 32.4	174 39.7	72	+12 41.0	+145
1	206 49.0	179 13.0	41.2	300 30.8	22.1	126 59.7	55.3	350 35.5	32.3	189 05.9	72	12 55.5	+145
2	221 51.5	194 12.6	42.4	315 32.1	22.2	142 01.7	55.3	5 38.2	32.2	203 32.1	71	13 10.0	+143
3	236 53.9	209 12.2	•• 43.6	330 33.5	•• 22.3	157 03.8	•• 55.4	20 40.8	•• 32.2	217 58.2	70	·13 24.3	+142
4	251 56.4	224 11.7	44.7	345 34.8	22.4	172 05.9	55.4	35 43.4	32.1	232 24.2	70	13 38.5	+142
5	266 58.9	239 11.3	45.9	0 36.2	22.5	187 07.9	55.4	50 46.0	32.1	246 50.2	69	13 52.7	+140
6	282 01.3	254 10.8	+10 47.1	15 37.5	−23 22.6	202 10.0	+22 55.5	65 48.6	−11 32.0	261 16.1	68	+14 06.7	+140
7	297 03.8	269 10.4	48.3	30 38.9	22.7	217 12.0	55.5	80 51.3	32.0	275 41.9	67	14 20.7	+139
8	312 06.2	284 09.9	49.4	45 40.2	22.7	232 14.1	55.5	95 53.9	31.9	290 07.6	67	14 34.6	+137
9	327 08.7	299 09.5	•• 50.6	60 41.5	•• 22.8	247 16.2	•• 55.6	110 56.5	•• 31.8	304 33.3	67	·14 48.3	+137
10	342 11.2	314 09.0	51.8	75 42.9	22.9	262 18.2	55.6	125 59.1	31.8	318 59.0	65	15 02.0	+135
11	357 13.6	329 08.6	53.0	90 44.2	23.0	277 20.3	55.6	141 01.8	31.7	333 24.5	65	15 15.5	+135
12	12 16.1	344 08.1	+10 54.1	105 45.6	−23 23.1	292 22.4	+22 55.7	156 04.4	−11 31.7	347 50.0	64	+15 29.0	+133
13	27 18.6	359 07.7	55.3	120 46.9	23.2	307 24.4	55.7	171 07.0	31.6	2 15.4	64	15 42.3	+133
14	42 21.0	14 07.3	56.5	135 48.3	23.3	322 26.5	55.7	186 09.6	31.6	16 40.8	63	15 55.6	+131
15	57 23.5	29 06.8	•• 57.6	150 49.6	•• 23.4	337 28.5	•• 55.8	201 12.2	•• 31.5	31 06.1	62	·16 08.7	+130
16	72 26.0	44 06.4	10 58.8	165 50.9	23.5	352 30.6	55.8	216 14.9	31.4	45 31.3	62	16 21.7	+129
17	87 28.4	59 05.9	11 00.0	180 52.3	23.6	7 32.7	55.8	231 17.5	31.4	59 56.5	60	16 34.6	+128
18	102 30.9	74 05.5	+11 01.2	195 53.6	−23 23.7	22 34.7	+22 55.9	246 20.1	−11 31.3	74 21.5	61	+16 47.4	+126
19	117 33.3	89 05.0	02.3	210 55.0	23.8	37 36.8	55.9	261 22.7	31.3	88 46.6	59	17 00.0	+126
20	132 35.8	104 04.6	03.5	225 56.3	23.9	52 38.8	55.9	276 25.4	31.2	103 11.5	59	17 12.6	+124
21	147 38.3	119 04.1	•• 04.7	240 57.7	•• 24.0	67 40.9	•• 56.0	291 28.0	•• 31.2	117 36.4	58	·17 25.0	+123
22	162 40.7	134 03.7	05.8	255 59.0	24.0	82 43.0	56.0	306 30.6	31.1	132 01.2	58	17 37.3	+122
23	177 43.2	149 03.2	07.0	271 00.4	24.1	97 45.0	56.0	321 33.2	31.0	146 26.0	57	17 49.5	+120
5 0	192 45.7	164 02.8	+11 08.2	286 01.7	−23 24.2	112 47.1	+22 56.0	336 35.9	−11 31.0	160 50.7	56	+18 01.5	+119
1	207 48.1	179 02.3	09.3	301 03.1	24.3	127 49.1	56.1	351 38.5	30.9	175 15.3	56	18 13.4	+118
2	222 50.6	194 01.9	10.5	316 04.4	24.4	142 51.2	56.1	6 41.1	30.9	189 39.9	55	18 25.2	+116
3	237 53.1	209 01.4	•• 11.6	331 05.8	•• 24.5	157 53.3	•• 56.1	21 43.7	•• 30.8	204 04.4	54	·18 36.8	+115
4	252 55.5	224 01.0	12.8	346 07.1	24.6	172 55.3	56.2	36 46.4	30.7	218 28.8	54	18 48.3	+114
5	267 58.0	239 00.5	14.0	1 08.5	24.7	187 57.4	56.2	51 49.0	30.7	232 53.2	53	18 59.7	+112
6	283 00.5	254 00.1	+11 15.1	16 09.8	−23 24.8	202 59.4	+22 56.2	66 51.6	−11 30.6	247 17.5	53	+19 10.9	+111
7	298 02.9	268 59.6	16.3	31 11.2	24.9	218 01.5	56.3	81 54.2	30.6	261 41.8	52	19 22.0	+110
8	313 05.4	283 59.1	17.5	46 12.5	25.0	233 03.5	56.3	96 56.9	30.5	276 06.0	51	19 33.0	+108
9	328 07.8	298 58.7	•• 18.6	61 13.9	•• 25.0	248 05.6	•• 56.3	111 59.5	•• 30.5	290 30.1	51	·19 43.8	+107
10	343 10.3	313 58.2	19.8	76 15.3	25.1	263 07.7	56.4	127 02.1	30.4	304 54.2	50	19 54.5	+105
11	358 12.8	328 57.8	20.9	91 16.6	25.2	278 09.7	56.4	142 04.7	30.3	319 18.2	50	20 05.0	+104
12	13 15.2	343 57.3	+11 22.1	106 18.0	−23 25.3	293 11.8	+22 56.4	157 07.3	−11 30.3	333 42.2	49	+20 15.4	+102
13	28 17.7	358 56.9	23.3	121 19.3	25.4	308 13.8	56.5	172 10.0	30.2	348 06.1	48	20 25.6	+101
14	43 20.2	13 56.4	24.4	136 20.7	25.5	323 15.9	56.5	187 12.6	30.2	2 29.9	48	20 35.7	+ 99
15	58 22.6	28 56.0	•• 25.6	151 22.0	•• 25.6	338 17.9	•• 56.5	202 15.2	•• 30.1	16 53.7	48	·20 45.6	+ 98
16	73 25.1	43 55.5	26.7	166 23.4	25.7	353 20.0	56.6	217 17.8	30.1	31 17.5	47	20 55.4	+ 96
17	88 27.6	58 55.1	27.9	181 24.8	25.8	8 22.0	56.6	232 20.5	30.0	45 41.2	46	21 05.0	+ 95
18	103 30.0	73 54.6	+11 29.1	196 26.1	−23 25.9	23 24.1	+22 56.6	247 23.1	−11 29.9	60 04.8	46	+21 14.5	+ 93
19	118 32.5	88 54.1	30.2	211 27.5	26.0	38 26.1	56.6	262 25.7	29.9	74 28.4	46	21 23.8	+ 91
20	133 34.9	103 53.7	31.4	226 28.8	26.0	53 28.2	56.7	277 28.3	29.8	88 52.0	45	21 32.9	+ 90
21	148 37.4	118 53.2	•• 32.5	241 30.2	•• 26.1	68 30.3	•• 56.7	292 31.0	•• 29.8	103 15.5	45	·21 41.9	+ 88
22	163 39.9	133 52.8	33.7	256 31.6	26.2	83 32.3	56.7	307 33.6	29.7	117 39.0	44	21 50.7	+ 87
23	178 42.3	148 52.3	34.8	271 32.9	26.3	98 34.4	56.8	322 36.2	29.6	132 02.4	44	21 59.4	+ 85
6 0	193 44.8	163 51.9	+11 36.0	286 34.3	−23 26.4	113 36.4	+22 56.8	337 38.9	−11 29.6	146 25.8	43	+22 07.9	+ 84
1	208 47.3	178 51.4	37.2	301 35.6	26.5	128 38.5	56.8	352 41.5	29.5	160 49.1	43	22 16.3	+ 81
2	223 49.7	193 50.9	38.3	316 37.0	26.6	143 40.5	56.9	7 44.1	29.5	175 12.4	42	22 24.4	+ 80
3	238 52.2	208 50.5	•• 39.5	331 38.4	•• 26.7	158 42.6	•• 56.9	22 46.7	•• 29.4	189 35.6	43	·22 32.4	+ 79
4	253 54.7	223 50.0	40.6	346 39.7	26.8	173 44.6	56.9	37 49.4	29.4	203 58.9	42	22 40.3	+ 77
5	268 57.1	238 49.6	41.8	1 41.1	26.8	188 46.7	57.0	52 52.0	29.3	218 22.1	41	22 48.0	+ 75
6	283 59.6	253 49.1	+11 42.9	16 42.5	−23 26.9	203 48.7	+22 57.0	67 54.6	−11 29.2	232 45.2	41	+22 55.5	+ 73
7	299 02.1	268 48.6	44.1	31 43.8	27.0	218 50.8	57.0	82 57.2	29.2	247 08.3	41	23 02.8	+ 72
8	314 04.5	283 48.2	45.2	46 45.2	27.1	233 52.8	57.1	97 59.9	29.1	261 31.4	41	23 10.0	+ 70
9	329 07.0	298 47.7	•• 46.4	61 46.6	•• 27.2	248 54.9	•• 57.1	113 02.5	•• 29.1	275 54.5	41	·23 17.0	+ 68
10	344 09.4	313 47.3	47.5	76 47.9	27.3	263 56.9	57.1	128 05.1	29.0	290 17.6	40	23 23.8	+ 66
11	359 11.9	328 46.8	48.7	91 49.3	27.4	278 59.0	57.2	143 07.7	28.9	304 40.6	40	23 30.4	+ 65
12	14 14.4	343 46.3	+11 49.8	106 50.7	−23 27.5	294 01.0	+22 57.2	158 10.4	−11 28.9	319 03.6	40	+23 36.9	+ 63
13	29 16.8	358 45.9	51.0	121 52.0	27.6	309 03.1	57.2	173 13.0	28.8	333 26.6	39	23 43.2	+ 62
14	44 19.3	13 45.4	52.1	136 53.4	27.6	324 05.1	57.2	188 15.6	28.8	347 49.5	40	23 49.4	+ 59
15	59 21.8	28 44.9	•• 53.3	151 54.8	•• 27.7	339 07.2	•• 57.3	203 18.2	•• 28.7	2 12.5	39	·23 55.3	+ 58
16	74 24.2	43 44.5	54.4	166 56.2	27.8	354 09.2	57.3	218 20.9	28.7	16 35.4	39	24 01.1	+ 56
17	89 26.7	58 44.0	55.6	181 57.5	27.9	9 11.3	57.3	233 23.5	28.6	30 58.3	39	24 06.7	+ 54
18	104 29.2	73 43.5	+11 56.7	196 58.9	−23 28.0	24 13.3	+22 57.4	248 26.1	−11 28.5	45 21.2	39	+24 12.1	+ 53
19	119 31.6	88 43.1	57.8	212 00.3	28.1	39 15.4	57.4	263 28.8	28.5	59 44.1	39	24 17.4	+ 51
20	134 34.1	103 42.6	11 59.0	227 01.6	28.2	54 17.4	57.4	278 31.4	28.4	74 07.0	39	24 22.5	+ 49
21	149 36.6	118 42.2	·12 00.1	242 03.0	•• 28.3	69 19.5	•• 57.5	293 34.0	•• 28.4	88 29.9	38	·24 27.4	+ 47
22	164 39.0	133 41.7	01.3	257 04.4	28.4	84 21.5	57.5	308 36.6	28.3	102 52.7	39	24 32.1	+ 45
23	179 41.5	148 41.2	02.4	272 05.8	28.4	99 23.6	57.5	323 39.3	28.2	117 15.6	39	24 36.6	+ 44
24	194 43.9	163 40.8	+12 03.6	287 07.1	−23 28.5	114 25.6	+22 57.6	338 41.9	−11 28.2	131 38.5	39	+24 41.0	+ 42
code	—	− 4	+ 12	+ 13	− 1	+ 20	+ 1	+ 27	+ 1				

GMT		SUN GHA	Dec.
	h	° ′	° ′
4	0	179 11.0	+ 5 24.1
	1	194 11.2	25.1
	2	209 11.3	26.1
	3	224 11.5	•• 27.0
	4	239 11.7	28.0
	5	254 11.9	28.9
	6	269 12.1	+ 5 29.9
	7	284 12.2	30.8
	8	299 12.4	31.8
	9	314 12.6	•• 32.7
	10	329 12.8	33.7
	11	344 13.0	34.7
	12	359 13.2	+ 5 35.6
	13	14 13.3	36.6
	14	29 13.5	37.5
	15	44 13.7	•• 38.5
	16	59 13.9	39.4
	17	74 14.1	40.4
	18	89 14.3	+ 5 41.3
	19	104 14.4	42.3
	20	119 14.6	43.2
	21	134 14.8	•• 44.2
	22	149 15.0	45.1
	23	164 15.2	46.1
5	0	179 15.4	+ 5 47.1
	1	194 15.5	48.0
	2	209 15.7	49.0
	3	224 15.9	•• 49.9
	4	239 16.1	50.9
	5	254 16.3	51.8
	6	269 16.4	+ 5 52.8
	7	284 16.6	53.7
	8	299 16.8	54.7
	9	314 17.0	•• 55.6
	10	329 17.2	56.6
	11	344 17.3	57.5
	12	359 17.5	+ 5 58.5
	13	14 17.7	5 59.4
	14	29 17.9	6 00.4
	15	44 18.1	•• 01.3
	16	59 18.3	02.3
	17	74 18.4	03.2
	18	89 18.6	+ 6 04.2
	19	104 18.8	05.1
	20	119 19.0	06.1
	21	134 19.2	•• 07.0
	22	149 19.3	08.0
	23	164 19.5	08.9
6	0	179 19.7	+ 6 09.9
	1	194 19.9	10.8
	2	209 20.1	11.8
	3	224 20.2	•• 12.7
	4	239 20.4	13.7
	5	254 20.6	14.6
	6	269 20.8	+ 6 15.6
	7	284 21.0	16.5
	8	299 21.1	17.4
	9	314 21.3	•• 18.4
	10	329 21.5	19.3
	11	344 21.7	20.3
	12	359 21.8	+ 6 21.2
	13	14 22.0	22.2
	14	29 22.2	23.1
	15	44 22.4	•• 24.1
	16	59 22.6	25.0
	17	74 22.7	26.0
	18	89 22.9	+ 6 26.9
	19	104 23.1	27.8
	20	119 23.3	28.8
	21	134 23.5	•• 29.7
	22	149 23.6	30.7
	23	164 23.8	31.6
	24	179 24.0	+ 6 32.6
code		—	+ 9

STARS No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 52.3	−40 29.3
5	Achernar	336 00.1	−57 28.1
30	Acrux	173 58.5	−62 51.0
19	Adhara	255 47.4	−28 54.7
10	Aldebaran	291 40.6	+16 25.2
32	Alioth	166 58.8	+56 12.3
34	Alkaid	153 33.2	+49 32.2
55	Al Na'ir	28 39.6	−47 10.9
15	Alnilam	276 31.5	− 1 13.8
25	Alphard	218 39.5	− 8 27.8
41	Alphecca	126 48.3	+26 51.7
1	Alpheratz	358 29.9	+28 50.2
51	Altair	62 51.6	+ 8 44.6
2	Ankaa	353 59.7	−42 33.2
42	Antares	113 20.5	−26 20.0
37	Arcturus	146 35.8	+19 24.9
43	Atria	109 02.0	−68 56.7
22	Avior	234 36.1	−59 22.0
13	Bellatrix	279 19.8	+ 6 18.6
16	Betelg'se	271 49.4	+ 7 24.0
17	Canopus	264 16.0	−52 40.5
12	Capella	281 40.3	+45 57.4
53	Deneb	50 02.0	+45 06.7
28	Denebola	183 18.5	+14 49.5
4	Diphda	349 40.7	−18 14.2
27	Dubhe	194 45.2	+61 59.9
14	Elnath	279 08.9	+28 34.3
47	Eltanin	91 06.6	+51 29.2
54	Enif	34 30.9	+ 9 39.8
56	Fomalhaut	16 13.1	−29 51.9
31	Gacrux	172 50.0	−56 51.7
29	Gienah	176 37.7	−17 17.5
35	Hadar	149 50.5	−60 09.3
6	Hamal	328 51.3	+23 14.9
48	Kaus Aust.	84 42.6	−34 24.5
40	Kochab	137 16.6	+74 20.3
57	Markab	14 22.9	+14 57.4
8	Menkar	315 01.8	+ 3 54.7
36	Menkent	148 59.7	−36 08.9
24	Miapl'dus	221 49.0	−69 32.0
9	Mirfak	309 44.4	+49 42.2
50	Nunki	76 53.2	−26 21.3
52	Peacock	54 29.1	−56 52.8
21	Pollux	244 21.9	+28 08.3
20	Procyon	245 46.1	+ 5 20.5
46	R'alhague	96 47.5	+12 35.3
26	Regulus	208 30.5	+12 11.4
11	Rigel	281 54.9	− 8 15.3
38	Rigil Kent.	140 52.0	−60 39.0
44	Sabik	103 03.3	−15 40.3
3	Schedar	350 31.9	+56 17.2
45	Shaula	97 22.0	−37 04.3
18	Sirius	259 12.9	−16 39.3
33	Spica	159 17.8	−10 55.6
23	Suhail	223 25.0	−43 15.1
49	Vega	81 09.0	+38 44.1
39	Zub'g'bi	137 54.3	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 4	5	6	7
N °	h m	h m	h m	h m	h m	h m
72	4 37	////	3 22	▭	▭	▭
70	4 47	////	3 46	2 59	▭	▭
68	4 54	////	4 05	3 40	▭	▭
66	5 01	0 31	4 20	4 09	3 50	▭
64	5 06	1 39	4 33	4 31	4 32	4 39
62	5 11	2 11	4 44	4 49	5 00	5 24
60	5 15	2 34	4 53	5 04	5 22	5 54
58	5 18	2 51	5 01	5 17	5 40	6 17
56	5 21	3 05	5 08	5 28	5 55	6 36
54	5 24	3 17	5 15	5 38	6 08	6 51
52	5 27	3 27	5 21	5 46	6 20	7 05
50	5 29	3 35	5 26	5 54	6 30	7 17
45	5 34	3 53	5 37	6 11	6 52	7 42
40	5 39	4 06	5 47	6 25	7 09	8 01
35	5 42	4 16	5 55	6 37	7 24	8 18
30	5 45	4 26	6 02	6 47	7 37	8 32
20	5 51	4 38	6 15	7 05	7 59	8 57
10	5 55	4 46	6 26	7 21	8 18	9 18
0	5 59	4 51	6 37	7 35	8 36	9 38
10	6 04	4 54	6 48	7 50	8 54	9 58
20	6 08	4 55	6 59	8 06	9 14	10 19
30	6 13	4 53	7 13	8 25	9 37	10 44
35	6 15	4 51	7 20	8 36	9 50	10 59
40	6 18	4 47	7 29	8 49	10 05	11 16
45	6 22	4 44	7 40	9 03	10 24	11 36
50	6 26	4 37	7 52	9 22	10 47	12 02
52	6 28	4 34	7 59	9 30	10 58	12 14
54	6 30	4 30	8 05	9 40	11 11	12 29
56	6 32	4 26	8 12	9 51	11 25	12 45
58	6 35	4 21	8 21	10 04	11 42	13 05
60 S	6 38	4 16	8 30	10 19	12 03	13 30

Lat.	Sunset	Twlt. ends	Moonset 4	5	6	7
N °	h m	h m	h m	h m	h m	h m
72	19 32	////	▭	▭	▭	▭
70	19 22	////	23 20	▭	▭	▭
68	19 14	////	22 40	▭	▭	▭
66	19 07	////	22 13	24 38	0 38	▭
64	19 01	22 37	21 52	23 57	26 00	2 00
62	18 57	22 03	21 35	23 29	25 15	1 15
60	18 52	21 38	21 21	23 08	24 45	0 45
58	18 49	21 21	21 09	22 51	24 22	0 22
56	18 45	21 05	20 59	22 36	24 04	0 04
54	18 42	20 53	20 50	22 23	23 48	24 58
52	18 40	20 43	20 42	22 12	23 35	24 44
50	18 37	20 33	20 35	22 02	23 23	24 31
45	18 32	20 15	20 19	21 42	22 59	24 06
40	18 28	20 02	20 07	21 25	22 39	23 45
35	18 24	19 51	19 56	21 11	22 23	23 28
30	18 21	19 42	19 47	20 59	22 09	23 14
20	18 15	19 29	19 31	20 39	21 45	22 49
10	18 11	19 21	19 17	20 21	21 25	22 27
0	18 06	19 15	19 04	20 04	21 06	22 07
10	18 02	19 12	18 51	19 47	20 46	21 47
20	17 57	19 10	18 38	19 30	20 26	21 25
30	17 53	19 12	18 22	19 09	20 02	21 00
35	17 50	19 14	18 13	18 57	19 48	20 46
40	17 47	19 17	18 03	18 44	19 32	20 28
45	17 43	19 20	17 51	18 28	19 13	20 08
50	17 39	19 26	17 37	18 08	18 49	19 42
52	17 37	19 29	17 30	17 59	18 38	19 29
54	17 35	19 33	17 22	17 49	18 25	19 15
56	17 32	19 36	17 14	17 37	18 10	18 58
58	17 30	19 41	17 05	17 23	17 52	18 39
60 S	17 27	19 46	16 54	17 08	17 31	18 13

GMT	Equation of Time (App.—Mean) 4	5	6
h	m s	m s	m s
0	− 3 16.5	− 2 59.0	− 2 41.6
6	− 3 12.1	− 2 54.6	− 2 37.3
12	− 3 07.7	− 2 50.3	− 2 33.0
18	− 3 03.3	− 2 45.9	− 2 28.7
24	− 2 59.0	− 2 41.6	− 2 24.4

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
4	12 51	13 04	4 58	16 30	1 38
5	13 50	13 04	4 55	16 27	1 33
6	14 51	13 05	4 53	16 23	1 29
7	15 53	13 06	4 51	16 20	1 25

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0–30	0.3	0.1	0.2
30–45	0.3	0.1	0.1
45–60	0.3	0.1	0.1
60–75	0.3	0.0	0.1
75–90	0.3	0.0	0.0

Moon's Lower Limb Add

Alt.	4	5	6
°	′	′	′
0–4	21.0	20.6	19.7
4–8	21.0	20.6	19.7
8–12	21.0	20.6	19.7
12–16	20.9	20.5	19.7
16–20	20.8	20.4	19.6
20–24	20.7	20.4	19.5
24–28	20.6	20.2	19.4
28–32	20.4	20.1	19.3
32–36	20.3	20.0	19.2
36–40	20.1	19.8	19.1
40–44	19.9	19.6	18.9
44–48	19.7	19.4	18.7
48–52	19.5	19.2	18.6
52–56	19.2	19.0	18.4
56–60	19.0	18.8	18.2
60–64	18.7	18.5	18.0
64–68	18.5	18.3	17.8
68–72	18.2	18.0	17.6
72–76	17.9	17.7	17.4
76–80	17.6	17.5	17.1
80–84	17.3	17.2	16.9
84–88	17.0	16.9	16.7
88–90	16.8	16.7	16.5

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	4	5	6
°	′	′	′
0–4	12.4	12.6	13.2
4–8	12.5	12.7	13.2
8–12	12.5	12.7	13.2
12–16	12.5	12.8	13.2
16–20	12.6	12.8	13.3
20–24	12.7	12.9	13.4
24–28	12.9	13.0	13.5
28–32	13.0	13.2	13.6
32–36	13.2	13.3	13.7
36–40	13.3	13.5	13.8
40–44	13.5	13.7	14.0
44–48	13.7	13.9	14.2
48–52	14.0	14.1	14.3
52–56	14.2	14.3	14.5
56–60	14.4	14.5	14.7
60–64	14.7	14.8	14.9
64–68	15.0	15.0	15.1
68–72	15.2	15.3	15.3
72–76	15.5	15.5	15.5
76–80	15.8	15.8	15.8
80–84	16.1	16.1	16.0
84–88	16.4	16.4	16.2
88–90	16.6	16.6	16.4

Subtract from table, back cover

GMT	♈ GHA	VENUS −3.3 GHA	VENUS Dec.	MARS 0.0 GHA	MARS Dec.	JUPITER −1.7 GHA	JUPITER Dec.	SATURN 0.4 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
7 0	194 43.9	163 40.8	+12 03.6	287 07.1	−23 28.5	114 25.6	+22 57.6	338 41.9	−11 28.2	131 38.5	39	+24 41.0	+ 42
1	209 46.4	178 40.3	04.7	302 08.5	28.6	129 27.7	57.6	353 44.5	28.1	146 01.4	39	24 45.2	+ 40
2	224 48.9	193 39.8	05.8	317 09.9	28.7	144 29.7	57.6	8 47.1	28.1	160 24.3	39	24 49.2	+ 38
3	239 51.3	208 39.4	•• 07.0	332 11.3	•• 28.8	159 31.8	•• 57.7	23 49.8	•• 28.0	174 47.2	39	·24 53.0	+ 36
4	254 53.8	223 38.9	08.1	347 12.7	28.9	174 33.8	57.7	38 52.4	28.0	189 10.1	39	24 56.6	+ 35
5	269 56.3	238 38.4	09.3	2 14.0	29.0	189 35.9	57.7	53 55.0	27.9	203 33.0	39	25 00.1	+ 33
6	284 58.7	253 37.9	+12 10.4	17 15.4	−23 29.1	204 37.9	+22 57.8	68 57.7	−11 27.8	217 55.9	40	+25 03.4	+ 31
7	300 01.2	268 37.5	11.6	32 16.8	29.1	219 40.0	57.8	84 00.3	27.8	232 18.9	39	25 06.5	+ 29
8	315 03.7	283 37.0	12.7	47 18.2	29.2	234 42.0	57.8	99 02.9	27.7	246 41.8	40	25 09.4	+ 28
9	330 06.1	298 36.5	•• 13.8	62 19.6	•• 29.3	249 44.1	•• 57.8	114 05.5	•• 27.7	261 04.8	40	·25 12.2	+ 26
10	345 08.6	313 36.1	15.0	77 20.9	29.4	264 46.1	57.9	129 08.2	27.6	275 27.8	40	25 14.8	+ 24
11	0 11.1	328 35.6	16.1	92 22.3	29.5	279 48.1	57.9	144 10.8	27.5	289 50.8	41	25 17.2	+ 22
12	15 13.5	343 35.1	+12 17.2	107 23.7	−23 29.6	294 50.2	+22 57.9	159 13.4	−11 27.5	304 13.9	41	+25 19.4	+ 20
13	30 16.0	358 34.7	18.4	122 25.1	29.7	309 52.2	58.0	174 16.1	27.4	318 37.0	41	25 21.4	+ 19
14	45 18.4	13 34.2	19.5	137 26.5	29.8	324 54.3	58.0	189 18.7	27.4	333 00.1	41	25 23.3	+ 17
15	60 20.9	28 33.7	•• 20.7	152 27.9	•• 29.8	339 56.3	•• 58.0	204 21.3	•• 27.3	347 23.2	42	·25 25.0	+ 15
16	75 23.4	43 33.2	21.8	167 29.2	29.9	354 58.4	58.1	219 23.9	27.2	1 46.4	43	25 26.5	+ 13
17	90 25.8	58 32.8	22.9	182 30.6	30.0	10 00.4	58.1	234 26.6	27.2	16 09.7	42	25 27.8	+ 12
18	105 28.3	73 32.3	+12 24.1	197 32.0	−23 30.1	25 02.5	+22 58.1	249 29.2	−11 27.1	30 32.9	43	+25 29.0	+ 10
19	120 30.8	88 31.8	25.2	212 33.4	30.2	40 04.5	58.2	264 31.8	27.1	44 56.2	43	25 30.0	+ 8
20	135 33.2	103 31.3	26.3	227 34.8	30.3	55 06.5	58.2	279 34.5	27.0	59 19.5	44	25 30.8	+ 6
21	150 35.7	118 30.9	•• 27.5	242 36.2	•• 30.4	70 08.6	•• 58.2	294 37.1	•• 27.0	73 42.9	45	·25 31.4	+ 5
22	165 38.2	133 30.4	28.6	257 37.6	30.4	85 10.6	58.3	309 39.7	26.9	88 06.4	44	25 31.9	+ 3
23	180 40.6	148 29.9	29.7	272 38.9	30.5	100 12.7	58.3	324 42.3	26.8	102 29.8	46	25 32.2	+ 1
8 0	195 43.1	163 29.4	+12 30.8	287 40.3	−23 30.6	115 14.7	+22 58.3	339 45.0	−11 26.8	116 53.4	46	+25 32.3	− 1
1	210 45.5	178 29.0	32.0	302 41.7	30.7	130 16.8	58.3	354 47.6	26.7	131 17.0	46	25 32.2	− 2
2	225 48.0	193 28.5	33.1	317 43.1	30.8	145 18.8	58.4	9 50.2	26.7	145 40.6	47	25 32.0	− 4
3	240 50.5	208 28.0	•• 34.2	332 44.5	•• 30.9	160 20.8	•• 58.4	24 52.9	•• 26.6	160 04.3	47	·25 31.6	− 5
4	255 52.9	223 27.5	35.4	347 45.9	31.0	175 22.9	58.4	39 55.5	26.5	174 28.0	49	25 31.1	− 8
5	270 55.4	238 27.1	36.5	2 47.3	31.0	190 24.9	58.5	54 58.1	26.5	188 51.9	48	25 30.3	− 9
6	285 57.9	253 26.6	+12 37.6	17 48.7	−23 31.1	205 27.0	+22 58.5	70 00.8	−11 26.4	203 15.7	50	+25 29.4	− 10
7	301 00.3	268 26.1	38.7	32 50.1	31.2	220 29.0	58.5	85 03.4	26.4	217 39.7	50	25 28.4	− 13
8	316 02.8	283 25.6	39.9	47 51.5	31.3	235 31.1	58.6	100 06.0	26.3	232 03.7	50	25 27.1	− 14
9	331 05.3	298 25.1	•• 41.0	62 52.9	•• 31.4	250 33.1	•• 58.6	115 08.6	•• 26.2	246 27.7	52	·25 25.7	− 15
10	346 07.7	313 24.7	42.1	77 54.3	31.5	265 35.1	58.6	130 11.3	26.2	260 51.9	52	25 24.2	− 18
11	1 10.2	328 24.2	43.3	92 55.6	31.6	280 37.2	58.7	145 13.9	26.1	275 16.1	53	25 22.4	− 19
12	16 12.7	343 23.7	+12 44.4	107 57.0	−23 31.6	295 39.2	+22 58.7	160 16.5	−11 26.1	289 40.4	53	+25 20.5	− 20
13	31 15.1	358 23.2	45.5	122 58.4	31.7	310 41.3	58.7	175 19.2	26.0	304 04.7	54	25 18.5	− 22
14	46 17.6	13 22.8	46.6	137 59.8	31.8	325 43.3	58.8	190 21.8	25.9	318 29.1	55	25 16.3	− 24
15	61 20.0	28 22.3	•• 47.7	153 01.2	•• 31.9	340 45.3	•• 58.8	205 24.4	•• 25.9	332 53.6	56	·25 13.9	− 25
16	76 22.5	43 21.8	48.9	168 02.6	32.0	355 47.4	58.8	220 27.1	25.8	347 18.2	57	25 11.4	− 27
17	91 25.0	58 21.3	50.0	183 04.0	32.1	10 49.4	58.8	235 29.7	25.8	1 42.9	57	25 08.7	− 28
18	106 27.4	73 20.8	+12 51.1	198 05.4	−23 32.2	25 51.5	+22 58.9	250 32.3	−11 25.7	16 07.6	58	+25 05.9	− 30
19	121 29.9	88 20.3	52.2	213 06.8	32.2	40 53.5	58.9	265 34.9	25.7	30 32.4	59	25 02.9	− 32
20	136 32.4	103 19.9	53.4	228 08.2	32.3	55 55.5	58.9	280 37.6	25.6	44 57.3	60	24 59.7	− 33
21	151 34.8	118 19.4	•• 54.5	243 09.6	•• 32.4	70 57.6	•• 59.0	295 40.2	•• 25.5	59 22.3	61	·24 56.4	− 34
22	166 37.3	133 18.9	55.6	258 11.0	32.5	85 59.6	59.0	310 42.8	25.5	73 47.4	61	24 53.0	− 36
23	181 39.8	148 18.4	56.7	273 12.4	32.6	101 01.6	59.0	325 45.5	25.4	88 12.5	63	24 49.4	− 38
9 0	196 42.2	163 17.9	+12 57.8	288 13.8	−23 32.7	116 03.7	+22 59.1	340 48.1	−11 25.4	102 37.8	63	+24 45.6	− 39
1	211 44.7	178 17.4	12 58.9	303 15.2	32.7	131 05.7	59.1	355 50.7	25.3	117 03.1	64	24 41.7	− 40
2	226 47.2	193 17.0	13 00.1	318 16.6	32.8	146 07.8	59.1	10 53.4	25.2	131 28.5	66	24 37.7	− 42
3	241 49.6	208 16.5	•• 01.2	333 18.0	•• 32.9	161 09.8	•• 59.2	25 56.0	•• 25.2	145 54.1	66	·24 33.5	− 43
4	256 52.1	223 16.0	02.3	348 19.5	33.0	176 11.8	59.2	40 58.6	25.1	160 19.7	67	24 29.2	− 45
5	271 54.5	238 15.5	03.4	3 20.9	33.1	191 13.9	59.2	56 01.3	25.1	174 45.4	68	24 24.7	− 46
6	286 57.0	253 15.0	+13 04.5	18 22.3	−23 33.2	206 15.9	+22 59.2	71 03.9	−11 25.0	189 11.2	68	+24 20.1	− 48
7	301 59.5	268 14.5	05.6	33 23.7	33.3	221 17.9	59.3	86 06.5	24.9	203 37.0	70	24 15.3	− 49
8	317 01.9	283 14.0	06.7	48 25.1	33.3	236 20.0	59.3	101 09.2	24.9	218 03.0	71	24 10.4	− 50
9	332 04.4	298 13.6	•• 07.9	63 26.5	•• 33.4	251 22.0	•• 59.3	116 11.8	•• 24.8	232 29.1	72	·24 05.4	− 52
10	347 06.9	313 13.1	09.0	78 27.9	33.5	266 24.0	59.4	131 14.4	24.8	246 55.3	72	24 00.2	− 53
11	2 09.3	328 12.6	10.1	93 29.3	33.6	281 26.1	59.4	146 17.1	24.7	261 21.5	74	23 54.9	− 55
12	17 11.8	343 12.1	+13 11.2	108 30.7	−23 33.7	296 28.1	+22 59.4	161 19.7	−11 24.6	275 47.9	75	+23 49.4	− 55
13	32 14.3	358 11.6	12.3	123 32.1	33.8	311 30.1	59.5	176 22.3	24.6	290 14.4	76	23 43.9	− 57
14	47 16.7	13 11.1	13.4	138 33.5	33.8	326 32.2	59.5	191 25.0	24.5	304 41.0	76	23 38.2	− 59
15	62 19.2	28 10.6	•• 14.5	153 34.9	•• 33.9	341 34.2	•• 59.5	206 27.6	•• 24.5	319 07.6	78	·23 32.3	− 59
16	77 21.7	43 10.1	15.6	168 36.4	34.0	356 36.3	59.6	221 30.2	24.4	333 34.4	79	23 26.4	− 61
17	92 24.1	58 09.6	16.7	183 37.8	34.1	11 38.3	59.6	236 32.8	24.3	348 01.3	79	23 20.3	− 63
18	107 26.6	73 09.1	+13 17.9	198 39.2	−23 34.2	26 40.3	+22 59.6	251 35.5	−11 24.3	2 28.2	81	+23 14.0	− 63
19	122 29.0	88 08.7	19.0	213 40.6	34.3	41 42.4	59.7	266 38.1	24.2	16 55.3	82	23 07.7	− 65
20	137 31.5	103 08.2	20.1	228 42.0	34.3	56 44.4	59.7	281 40.7	24.2	31 22.5	82	23 01.2	− 65
21	152 34.0	118 07.7	•• 21.2	243 43.4	•• 34.4	71 46.4	•• 59.7	296 43.4	•• 24.1	45 49.7	84	·22 54.7	− 67
22	167 36.4	133 07.2	22.3	258 44.8	34.5	86 48.4	59.7	311 46.0	24.0	60 17.1	85	22 48.0	− 69
23	182 38.9	148 06.7	23.4	273 46.3	34.6	101 50.5	59.8	326 48.6	24.0	74 44.6	86	22 41.1	− 69
24	197 41.4	163 06.2	+13 24.5	288 47.7	−23 34.7	116 52.5	+22 59.8	341 51.3	−11 23.9	89 12.2	87	+22 34.2	− 71
code	—	− 5	+ 11	+ 14	− 1	+ 21	0	+ 27	+ 1				

GMT		SUN GHA	Dec.
d	h	° ′	° ′
7	0	179 24.0	+ 6 32.6
	1	194 24.2	33.5
	2	209 24.3	34.5
	3	224 24.5	•• 35.4
	4	239 24.7	36.3
	5	254 24.9	37.3
	6	269 25.1	+ 6 38.2
	7	284 25.2	39.2
	8	299 25.4	40.1
	9	314 25.6	•• 41.1
	10	329 25.8	42.0
	11	344 25.9	42.9
	12	359 26.1	+ 6 43.9
	13	14 26.3	44.8
	14	29 26.5	45.8
	15	44 26.7	•• 46.7
	16	59 26.8	47.6
	17	74 27.0	48.6
	18	89 27.2	+ 6 49.5
	19	104 27.4	50.5
	20	119 27.5	51.4
	21	134 27.7	•• 52.3
	22	149 27.9	53.3
	23	164 28.1	54.2
8	0	179 28.2	+ 6 55.2
	1	194 28.4	56.1
	2	209 28.6	57.0
	3	224 28.8	•• 58.0
	4	239 28.9	58.9
	5	254 29.1	6 59.8
	6	269 29.3	+ 7 00.8
	7	284 29.5	01.7
	8	299 29.6	02.7
	9	314 29.8	•• 03.6
	10	329 30.0	04.5
	11	344 30.2	05.5
	12	359 30.4	+ 7 06.4
	13	14 30.5	07.3
	14	29 30.7	08.3
	15	44 30.9	•• 09.2
	16	59 31.0	10.1
	17	74 31.2	11.1
	18	89 31.4	+ 7 12.0
	19	104 31.6	13.0
	20	119 31.7	13.9
	21	134 31.9	•• 14.8
	22	149 32.1	15.8
	23	164 32.3	16.7
9	0	179 32.4	+ 7 17.6
	1	194 32.6	18.6
	2	209 32.8	19.5
	3	224 33.0	•• 20.4
	4	239 33.1	21.4
	5	254 33.3	22.3
	6	269 33.5	+ 7 23.2
	7	284 33.7	24.2
	8	299 33.8	25.1
	9	314 34.0	•• 26.0
	10	329 34.2	27.0
	11	344 34.3	27.9
	12	359 34.5	+ 7 28.8
	13	14 34.7	29.7
	14	29 34.9	30.7
	15	44 35.0	•• 31.6
	16	59 35.2	32.5
	17	74 35.4	33.5
	18	89 35.6	+ 7 34.4
	19	104 35.7	35.3
	20	119 35.9	36.3
	21	134 36.1	•• 37.2
	22	149 36.2	38.1
	23	164 36.4	39.0
	24	179 36.6	+ 7 40.0
code		—	+ 9

STARS No.	Name	SHA ° ′	Dec. ° ′
7	Acamar	315 52.3	−40 29.3
5	Achernar	336 00.1	−57 28.1
30	Acrux	173 58.5	−62 51.0
19	Adhara	255 47.5	−28 54.7
10	Aldebaran	291 40.6	+16 25.2
32	Alioth	166 58.8	+56 12.3
34	Alkaid	153 33.2	+49 32.2
55	Al Na'ir	28 39.6	−47 10.9
15	Alnilam	276 31.5	− 1 13.8
25	Alphard	218 39.5	− 8 27.8
41	Alphecca	126 48.2	+26 51.8
1	Alpheratz	358 29.9	+28 50.2
51	Altair	62 51.5	+ 8 44.6
2	Ankaa	353 59.7	−42 33.2
42	Antares	113 20.5	−26 20.0
37	Arcturus	146 35.8	+19 24.9
43	Atria	109 02.0	−68 56.7
22	Avior	234 36.2	−59 22.0
13	Bellatrix	279 19.8	+ 6 18.6
16	Betelg'se	271 49.4	+ 7 24.0
17	Canopus	264 16.0	−52 40.5
12	Capella	281 40.3	+45 57.4
53	Deneb	50 02.0	+45 06.7
28	Denebola	183 18.5	+14 49.5
4	Diphda	349 40.7	−18 14.2
27	Dubhe	194 45.2	+61 59.9
14	Elnath	279 08.9	+28 34.3
47	Eltanin	91 06.6	+51 29.2
54	Enif	34 30.9	+ 9 39.8
56	Fomalhaut	16 13.1	−29 51.8
31	Gacrux	172 50.0	−56 51.7
29	Gienah	176 37.7	−17 17.5
35	Hadar	149 50.5	−60 09.3
6	Hamal	328 51.3	+23 14.9
48	Kaus Aust.	84 42.5	−34 24.5
40	Kochab	137 16.6	+74 20.3
57	Markab	14 22.8	+14 57.4
8	Menkar	315 01.8	+ 3 54.7
36	Menkent	148 59.6	−36 08.9
24	Miapl'dus	221 49.0	−69 32.1
9	Mirfak	309 44.4	+49 42.2
50	Nunki	76 53.2	−26 21.3
52	Peacock	54 29.1	−56 52.8
21	Pollux	244 21.9	+28 08.3
20	Procyon	245 46.1	+ 5 20.5
46	R'alhague	96 47.5	+12 35.3
26	Regulus	208 30.5	+12 11.4
11	Rigel	281 54.9	− 8 15.3
38	Rigil Kent.	140 52.0	−60 39.0
44	Sabik	103 03.3	−15 40.3
3	Schedar	350 31.9	+56 17.2
45	Shaula	97 22.0	−37 04.4
18	Sirius	259 12.9	−16 39.3
33	Spica	159 17.7	−10 55.6
23	Suhail	223 25.0	−43 15.1
49	Vega	81 08.9	+38 44.1
39	Zub'g'bl	137 54.3	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 7	8	9	10
°	h m	h m	h m	h m	h m	h m
N 72	4 21	////	□	□	□	□
70	4 32	////	□	□	□	□
68	4 42	////	□	□	□	7 05
66	4 49	////	□	□	□	8 14
64	4 56	1 09	4 39	5 20	6 59	8 49
62	5 01	1 52	5 24	6 16	7 38	9 14
60	5 06	2 19	5 54	6 49	8 06	9 34
58	5 10	2 38	6 17	7 13	8 27	9 51
56	5 14	2 54	6 36	7 33	8 45	10 05
54	5 17	3 07	6 51	7 49	8 59	10 17
52	5 20	3 18	7 05	8 03	9 12	10 27
50	5 23	3 28	7 17	8 15	9 23	10 36
45	5 29	3 47	7 42	8 41	9 47	10 56
40	5 34	4 00	8 01	9 01	10 06	11 12
35	5 38	4 12	8 18	9 18	10 21	11 25
30	5 42	4 21	8 32	9 33	10 35	11 37
20	5 48	4 35	8 57	9 57	10 58	11 57
10	5 54	4 43	9 18	10 19	11 18	12 14
0	5 59	4 50	9 38	10 39	11 37	12 30
10	6 04	4 54	9 58	10 59	11 55	12 46
20	6 09	4 55	10 19	11 20	12 15	13 03
30	6 15	4 55	10 44	11 45	12 38	13 23
35	6 18	4 53	10 59	12 00	12 51	13 34
40	6 21	4 50	11 16	12 16	13 07	13 47
45	6 26	4 47	11 36	12 37	13 25	14 03
50	6 31	4 42	12 02	13 02	13 48	14 21
52	6 33	4 39	12 14	13 15	13 59	14 30
54	6 36	4 36	12 29	13 29	14 11	14 40
56	6 38	4 32	12 45	13 45	14 25	14 51
58	6 41	4 28	13 05	14 04	14 41	15 04
S 60	6 45	4 23	13 30	14 29	15 01	15 19

Lat.	Sunset	Twlt. ends	Moonset 7	8	9	10
°	h m	h m	h m	h m	h m	h m
N 72	19 46	////	□	□	□	□
70	19 34	////	□	□	□	□
68	19 25	////	□	□	□	5 41
66	19 17	////	□	□	□	4 31
64	19 10	23 09	2 00	3 27	3 51	3 55
62	19 05	22 21	1 15	2 31	3 11	3 29
60	19 00	21 53	0 45	1 58	2 43	3 08
58	18 55	21 31	0 22	1 34	2 22	2 51
56	18 52	21 16	0 04	1 14	2 04	2 37
54	18 48	21 02	24 58	0 58	1 49	2 24
52	18 45	20 50	24 44	0 44	1 36	2 14
50	18 42	20 40	24 31	0 31	1 24	2 04
45	18 36	20 20	24 06	0 06	1 00	1 43
40	18 31	20 06	23 45	24 41	0 41	1 26
35	18 26	19 53	23 28	24 25	0 25	1 12
30	18 23	19 45	23 14	24 11	0 11	1 00
20	18 16	19 31	22 49	23 47	24 39	0 39
10	18 10	19 21	22 27	23 26	24 20	0 20
0	18 05	19 14	22 07	23 07	24 03	0 03
10	18 00	19 10	21 47	22 47	23 45	24 40
20	17 55	19 08	21 25	22 26	23 26	24 24
30	17 49	19 08	21 00	22 02	23 05	24 06
35	17 46	19 10	20 46	21 48	22 52	23 56
40	17 42	19 12	20 28	21 31	22 37	23 43
45	17 38	19 15	20 08	21 11	22 19	23 29
50	17 32	19 19	19 42	20 46	21 58	23 11
52	17 30	19 22	19 29	20 34	21 47	23 03
54	17 28	19 26	19 15	20 20	21 35	22 54
56	17 25	19 29	18 58	20 04	21 21	22 43
58	17 22	19 33	18 39	19 45	21 05	22 31
60	17 18	19 37	18 13	19 21	20 46	22 17
S						

GMT	Equation of Time (App.—Mean) 7	8	9
h	m s	m s	m s
0	− 2 24.4	− 2 07.4	− 1 50.6
6	− 2 20.1	− 2 03.2	− 1 46.4
12	− 2 15.9	− 1 58.9	− 1 42.3
18	− 2 11.6	− 1 54.8	− 1 38.1
24	− 2 07.4	− 1 50.6	− 1 34.0

GMT of Transit Meridian of Greenwich DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
7	15 53	13 06	4 51	16 20	1 25
8	16 53	13 07	4 49	16 17	1 21
9	17 50	13 07	4 47	16 14	1 17
10	18 42	13 08	4 44	16 10	1 12

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0–30	0.3	0.1	0.2
30–45	0.3	0.1	0.1
45–60	0.3	0.1	0.1
60–75	0.3	0.0	0.1
75–90	0.3	0.0	0.0

Moon's Lower Limb Add

Alt.	7	8	9
°	′	′	′
0–4	18.7	17.6	16.4
4–8	18.7	17.6	16.4
8–12	18.7	17.6	16.4
12–16	18.7	17.5	16.4
16–20	18.6	17.5	16.4
20–24	18.6	17.5	16.4
24–28	18.5	17.4	16.4
28–32	18.4	17.4	16.3
32–36	18.3	17.3	16.3
36–40	18.2	17.2	16.3
40–44	18.1	17.2	16.3
44–48	18.0	17.1	16.2
48–52	17.8	17.0	16.2
52–56	17.7	16.9	16.2
56–60	17.6	16.8	16.1
60–64	17.4	16.7	16.1
64–68	17.2	16.6	16.0
68–72	17.1	16.5	16.0
72–76	16.9	16.4	15.9
76–80	16.8	16.3	15.9
80–84	16.6	16.2	15.8
84–88	16.4	16.1	15.8
88–90	16.3	16.0	15.8

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	7	8	9
°	′	′	′
0–4	13.7	14.4	15.0
4–8	13.7	14.4	15.0
8–12	13.8	14.4	15.1
12–16	13.8	14.4	15.1
16–20	13.9	14.5	15.1
20–24	13.9	14.5	15.1
24–28	14.0	14.5	15.1
28–32	14.1	14.6	15.1
32–36	14.2	14.7	15.2
36–40	14.3	14.7	15.2
40–44	14.4	14.8	15.2
44–48	14.5	14.9	15.3
48–52	14.6	15.0	15.3
52–56	14.8	15.0	15.3
56–60	14.9	15.1	15.4
60–64	15.1	15.2	15.4
64–68	15.2	15.3	15.5
68–72	15.4	15.4	15.5
72–76	15.5	15.5	15.5
76–80	15.7	15.7	15.6
80–84	15.9	15.8	15.6
84–88	16.1	15.9	15.7
88–90	16.2	16.0	15.7

Subtract from table, back cover

GMT	h	♈ GHA	VENUS −3.3 GHA	VENUS Dec.	MARS −0.1 GHA	MARS Dec.	JUPITER −1.7 GHA	JUPITER Dec.	SATURN 0.4 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
10	0	197 41.4	163 06.2	+13 24.5	288 47.7	−23 34.7	116 52.5	+22 59.8	341 51.3	−11 23.9	89 12.2	87	+22 34.2	−71
	1	212 43.8	178 05.7	25.6	303 49.1	34.8	131 54.5	59.8	356 53.9	23.9	103 39.9	88	22 27.1	−71
	2	227 46.3	193 05.2	26.7	318 50.5	34.8	146 56.6	59.9	11 56.5	23.8	118 07.7	88	22 20.0	−73
	3	242 48.8	208 04.7	27.8	333 51.9	34.9	161 58.6	59.9	26 59.2	23.7	132 35.5	90	22 12.7	−74
	4	257 51.2	223 04.2	28.9	348 53.3	35.0	177 00.6	22 59.9	42 01.8	23.7	147 03.5	91	22 05.3	−75
	5	272 53.7	238 03.7	30.0	3 54.8	35.1	192 02.7	23 00.0	57 04.4	23.6	161 31.6	92	21 57.8	−77
	6	287 56.1	253 03.2	+13 31.1	18 56.2	−23 35.2	207 04.7	+23 00.0	72 07.1	−11 23.6	175 59.8	93	+21 50.1	−77
	7	302 58.6	268 02.7	32.2	33 57.6	35.3	222 06.7	00.0	87 09.7	23.5	190 28.1	94	21 42.4	−78
	8	318 01.1	283 02.2	33.3	48 59.0	35.3	237 08.8	00.1	102 12.3	23.4	204 56.5	96	21 34.6	−80
	9	333 03.5	298 01.7	34.4	64 00.4	35.4	252 10.8	00.1	117 15.0	23.4	219 25.1	96	21 26.6	−80
	10	348 06.0	313 01.2	35.5	79 01.9	35.5	267 12.8	00.1	132 17.6	23.3	233 53.7	97	21 18.6	−82
	11	3 08.5	328 00.7	36.6	94 03.3	35.6	282 14.9	00.1	147 20.2	23.3	248 22.4	98	21 10.4	−82
	12	18 10.9	343 00.2	+13 37.7	109 04.7	−23 35.7	297 16.9	+23 00.2	162 22.9	−11 23.2	262 51.2	99	+21 02.2	−84
	13	33 13.4	357 59.7	38.8	124 06.1	35.7	312 18.9	00.2	177 25.5	23.1	277 20.1	101	20 53.8	−84
	14	48 15.9	12 59.2	39.9	139 07.6	35.8	327 20.9	00.2	192 28.1	23.1	291 49.2	101	20 45.4	−85
	15	63 18.3	27 58.7	41.0	154 09.0	35.9	342 23.0	00.3	207 30.8	23.0	306 18.3	102	20 36.9	−87
	16	78 20.8	42 58.2	42.1	169 10.4	36.0	357 25.0	00.3	222 33.4	23.0	320 47.5	103	20 28.2	−87
	17	93 23.3	57 57.7	43.2	184 11.8	36.1	12 27.0	00.3	237 36.0	22.9	335 16.8	105	20 19.5	−89
	18	108 25.7	72 57.2	+13 44.3	199 13.3	−23 36.2	27 29.1	+23 00.4	252 38.7	−11 22.8	349 46.3	105	+20 10.6	−89
	19	123 28.2	87 56.7	45.4	214 14.7	36.2	42 31.1	00.4	267 41.3	22.8	4 15.8	106	20 01.7	−90
	20	138 30.6	102 56.2	46.5	229 16.1	36.3	57 33.1	00.4	282 43.9	22.7	18 45.4	107	19 52.7	−91
	21	153 33.1	117 55.7	47.6	244 17.5	36.4	72 35.1	00.5	297 46.6	22.7	33 15.1	109	19 43.6	−92
	22	168 35.6	132 55.2	48.6	259 19.0	36.5	87 37.2	00.5	312 49.2	22.6	47 45.0	109	19 34.4	−93
	23	183 38.0	147 54.7	49.7	274 20.4	36.6	102 39.2	00.5	327 51.8	22.5	62 14.9	110	19 25.1	−93
11	0	198 40.5	162 54.2	+13 50.8	289 21.8	−23 36.6	117 41.2	+23 00.5	342 54.5	−11 22.5	76 44.9	111	+19 15.8	−95
	1	213 43.0	177 53.7	51.9	304 23.3	36.7	132 43.2	00.6	357 57.1	22.4	91 15.0	113	19 06.3	−95
	2	228 45.4	192 53.2	53.0	319 24.7	36.8	147 45.3	00.6	12 59.7	22.4	105 45.3	113	18 56.8	−96
	3	243 47.9	207 52.7	54.1	334 26.1	36.9	162 47.3	00.6	28 02.4	22.3	120 15.6	114	18 47.2	−97
	4	258 50.4	222 52.2	55.2	349 27.6	37.0	177 49.3	00.7	43 05.0	22.2	134 46.0	115	18 37.5	−98
	5	273 52.8	237 51.7	56.3	4 29.0	37.1	192 51.4	00.7	58 07.7	22.2	149 16.5	116	18 27.7	−98
	6	288 55.3	252 51.2	+13 57.4	19 30.4	−23 37.1	207 53.4	+23 00.7	73 10.3	−11 22.1	163 47.1	117	+18 17.9	−100
	7	303 57.8	267 50.7	58.4	34 31.9	37.2	222 55.4	00.8	88 12.9	22.1	178 17.8	118	18 07.9	−100
	8	319 00.2	282 50.2	13 59.5	49 33.3	37.3	237 57.4	00.8	103 15.6	22.0	192 48.6	118	17 57.9	−101
	9	334 02.7	297 49.7	14 00.6	64 34.7	37.4	252 59.5	00.8	118 18.2	21.9	207 19.4	120	17 47.8	−101
	10	349 05.1	312 49.2	01.7	79 36.2	37.5	268 01.5	00.9	133 20.8	21.9	221 50.4	121	17 37.7	−102
	11	4 07.6	327 48.7	02.8	94 37.6	37.5	283 03.5	00.9	148 23.5	21.8	236 21.5	121	17 27.5	−103
	12	19 10.1	342 48.2	+14 03.9	109 39.0	−23 37.6	298 05.5	+23 00.9	163 26.1	−11 21.8	250 52.6	123	+17 17.2	−104
	13	34 12.5	357 47.7	05.0	124 40.5	37.7	313 07.6	00.9	178 28.7	21.7	265 23.9	123	17 06.8	−104
	14	49 15.0	12 47.1	06.0	139 41.9	37.8	328 09.6	01.0	193 31.4	21.6	279 55.2	124	16 56.4	−105
	15	64 17.5	27 46.6	07.1	154 43.4	37.9	343 11.6	01.0	208 34.0	21.6	294 26.6	126	16 45.9	−106
	16	79 19.9	42 46.1	08.2	169 44.8	37.9	358 13.6	01.0	223 36.6	21.5	308 58.2	125	16 35.3	−107
	17	94 22.4	57 45.6	09.3	184 46.2	38.0	13 15.7	01.1	238 39.3	21.5	323 29.7	127	16 24.6	−107
	18	109 24.9	72 45.1	+14 10.4	199 47.7	−23 38.1	28 17.7	+23 01.1	253 41.9	−11 21.4	338 01.4	128	+16 13.9	−107
	19	124 27.3	87 44.6	11.4	214 49.1	38.2	43 19.7	01.1	268 44.5	21.3	352 33.2	129	16 03.2	−109
	20	139 29.8	102 44.1	12.5	229 50.6	38.3	58 21.7	01.2	283 47.2	21.3	7 05.1	129	15 52.3	−108
	21	154 32.3	117 43.6	13.6	244 52.0	38.3	73 23.7	01.2	298 49.8	21.2	21 37.0	130	15 41.5	−110
	22	169 34.7	132 43.1	14.7	259 53.5	38.4	88 25.8	01.2	313 52.5	21.2	36 09.0	131	15 30.5	−110
	23	184 37.2	147 42.6	15.8	274 54.9	38.5	103 27.8	01.2	328 55.1	21.1	50 41.1	132	15 19.5	−111
12	0	199 39.6	162 42.0	+14 16.8	289 56.3	−23 38.6	118 29.8	+23 01.3	343 57.7	−11 21.0	65 13.3	133	+15 08.4	−111
	1	214 42.1	177 41.5	17.9	304 57.8	38.7	133 31.8	01.3	359 00.4	21.0	79 45.6	133	14 57.3	−112
	2	229 44.6	192 41.0	19.0	319 59.2	38.8	148 33.9	01.3	14 03.0	20.9	94 17.9	134	14 46.1	−112
	3	244 47.0	207 40.5	20.1	335 00.7	38.8	163 35.9	01.4	29 05.6	20.9	108 50.3	135	14 34.9	−113
	4	259 49.5	222 40.0	21.1	350 02.1	38.9	178 37.9	01.4	44 08.3	20.8	123 22.8	136	14 23.6	−113
	5	274 52.0	237 39.5	22.2	5 03.6	39.0	193 39.9	01.4	59 10.9	20.7	137 55.4	136	14 12.3	−114
	6	289 54.4	252 39.0	+14 23.3	20 05.0	−23 39.1	208 41.9	+23 01.5	74 13.5	−11 20.7	152 28.0	138	+14 00.9	−115
	7	304 56.9	267 38.4	24.4	35 06.5	39.2	223 44.0	01.5	89 16.2	20.6	167 00.8	138	13 49.4	−115
	8	319 59.4	282 37.9	25.4	50 07.9	39.2	238 46.0	01.5	104 18.8	20.5	181 33.6	138	13 37.9	−115
	9	335 01.8	297 37.4	26.5	65 09.4	39.3	253 48.0	01.6	119 21.5	20.5	196 06.4	140	13 26.4	−116
	10	350 04.3	312 36.9	27.6	80 10.8	39.4	268 50.0	01.6	134 24.1	20.4	210 39.4	140	13 14.8	−116
	11	5 06.7	327 36.4	28.6	95 12.3	39.5	283 52.0	01.6	149 26.7	20.4	225 12.4	141	13 03.2	−117
	12	20 09.2	342 35.9	+14 29.7	110 13.7	−23 39.6	298 54.1	+23 01.6	164 29.4	−11 20.3	239 45.5	141	+12 51.5	−117
	13	35 11.7	357 35.3	30.8	125 15.2	39.6	313 56.1	01.7	179 32.0	20.2	254 18.6	142	12 39.8	−118
	14	50 14.1	12 34.8	31.8	140 16.6	39.7	328 58.1	01.7	194 34.6	20.2	268 51.8	143	12 28.0	−118
	15	65 16.6	27 34.3	32.9	155 18.1	39.8	344 00.1	01.7	209 37.3	20.1	283 25.1	144	12 16.2	−119
	16	80 19.1	42 33.8	34.0	170 19.5	39.9	359 02.1	01.8	224 39.9	20.1	297 58.5	144	12 04.3	−118
	17	95 21.5	57 33.3	35.0	185 21.0	40.0	14 04.2	01.8	239 42.5	20.0	312 31.9	145	11 52.5	−120
	18	110 24.0	72 32.7	+14 36.1	200 22.5	−23 40.0	29 06.2	+23 01.8	254 45.2	−11 19.9	327 05.4	145	+11 40.5	−120
	19	125 26.5	87 32.2	37.2	215 23.9	40.1	44 08.2	01.9	269 47.8	19.9	341 38.9	146	11 28.5	−120
	20	140 28.9	102 31.7	38.2	230 25.4	40.2	59 10.2	01.9	284 50.5	19.8	356 12.5	147	11 16.5	−120
	21	155 31.4	117 31.2	39.3	245 26.8	40.3	74 12.2	01.9	299 53.1	19.8	10 46.2	148	11 04.5	−121
	22	170 33.9	132 30.7	40.4	260 28.3	40.3	89 14.3	01.9	314 55.7	19.7	25 20.0	147	10 52.4	−121
	23	185 36.3	147 30.1	41.4	275 29.7	40.4	104 16.3	02.0	329 58.4	19.6	39 53.7	149	10 40.3	−122
	24	200 38.8	162 29.6	+14 42.5	290 31.2	−23 40.5	119 18.3	+23 02.0	345 01.0	−11 19.6	54 27.6	149	+10 28.1	−122
code		—	− 5	+ 11	+ 15	− 1	+ 21	0	+ 26	+ 1				

GMT	SUN GHA	Dec.
h	° ′	° ′
10 0	179 36.6	+ 7 40.0
1	194 36.8	40.9
2	209 36.9	41.8
3	224 37.1 ••	42.8
4	239 37.3	43.7
5	254 37.4	44.6
6	269 37.6	+ 7 45.5
7	284 37.8	46.5
8	299 38.0	47.4
9	314 38.1 ••	48.3
10	329 38.3	49.2
11	344 38.5	50.2
12	359 38.6	+ 7 51.1
13	14 38.8	52.0
14	29 39.0	52.9
15	44 39.1 ••	53.9
16	59 39.3	54.8
17	74 39.5	55.7
18	89 39.7	+ 7 56.6
19	104 39.8	57.6
20	119 40.0	58.5
21	134 40.2 •	7 59.4
22	149 40.3	8 00.3
23	164 40.5	01.3
11 0	179 40.7	+ 8 02.2
1	194 40.8	03.1
2	209 41.0	04.0
3	224 41.2 ••	05.0
4	239 41.3	05.9
5	254 41.5	06.8
6	269 41.7	+ 8 07.7
7	284 41.8	08.6
8	299 42.0	09.6
9	314 42.2 ••	10.5
10	329 42.3	11.4
11	344 42.5	12.3
12	359 42.7	+ 8 13.2
13	14 42.8	14.2
14	29 43.0	15.1
15	44 43.2 ••	16.0
16	59 43.4	16.9
17	74 43.5	17.8
18	89 43.7	+ 8 18.8
19	104 43.9	19.7
20	119 44.0	20.6
21	134 44.2 ••	21.5
22	149 44.4	22.4
23	164 44.5	23.3
12 0	179 44.7	+ 8 24.3
1	194 44.8	25.2
2	209 45.0	26.1
3	224 45.2 ••	27.0
4	239 45.3	27.9
5	254 45.5	28.8
6	269 45.7	+ 8 29.8
7	284 45.8	30.7
8	299 46.0	31.6
9	314 46.2 ••	32.5
10	329 46.3	33.4
11	344 46.5	34.3
12	359 46.7	+ 8 35.2
13	14 46.8	36.2
14	29 47.0	37.1
15	44 47.2 ••	38.0
16	59 47.3	38.9
17	74 47.5	39.8
18	89 47.7	+ 8 40.7
19	104 47.8	41.6
20	119 48.0	42.5
21	134 48.1 ••	43.5
22	149 48.3	44.4
23	164 48.5	45.3
24	179 48.6	+ 8 46.2
code	—	+ 10

STARS No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 52.3	−40 29.3
5	Achernar	336 00.1	−57 28.1
30	Acrux	173 58.5	−62 51.0
19	Adhara	255 47.5	−28 54.7
10	Aldebaran	291 40.6	+16 25.2
32	Alioth	166 58.8	+56 12.3
34	Alkaid	153 33.2	+49 32.2
55	Al Na'ir	28 39.5	−47 10.8
15	Alnilam	276 31.6	− 1 13.8
25	Alphard	218 39.5	− 8 27.8
41	Alphecca	126 48.2	+26 51.8
1	Alpheratz	358 29.9	+28 50.2
51	Altair	62 51.5	+ 8 44.6
2	Ankaa	353 59.7	−42 33.2
42	Antares	113 20.5	−26 20.0
37	Arcturus	146 35.8	+19 24.9
43	Atria	109 01.9	−68 56.7
22	Avior	234 36.2	−59 22.0
13	Bellatrix	279 19.8	+ 6 18.6
16	Betelg'se	271 49.5	+ 7 24.0
17	Canopus	264 16.0	−52 40.5
12	Capella	281 40.3	+45 57.4
53	Deneb	50 01.9	+45 06.7
28	Denebola	183 18.5	+14 49.5
4	Diphda	349 40.7	−18 14.2
27	Dubhe	194 45.2	+61 59.9
14	Elnath	279 08.9	+28 34.3
47	Eltanin	91 06.5	+51 29.3
54	Enif	34 30.9	+ 9 39.8
56	Fomalhaut	16 13.1	−29 51.8
31	Gacrux	172 50.0	−56 51.7
29	Gienah	176 37.7	−17 17.5
35	Hadar	149 50.5	−60 09.4
6	Hamal	328 51.3	+23 14.9
48	Kaus Aust.	84 42.5	−34 24.5
40	Kochab	137 16.5	+74 20.3
57	Markab	14 22.8	+14 57.4
8	Menkar	315 01.8	+ 3 54.7
36	Menkent	148 59.6	−36 08.9
24	Miapl'dus	221 49.1	−69 32.1
9	Mirfak	309 44.5	+49 42.2
50	Nunki	76 53.2	−26 21.3
52	Peacock	54 29.1	−56 52.8
21	Pollux	244 21.9	+28 08.3
20	Procyon	245 46.1	+ 5 20.5
46	R'alhague	96 47.5	+12 35.3
26	Regulus	208 30.5	+12 11.4
11	Rigel	281 54.9	− 8 15.3
38	Rigil Kent.	140 52.0	−60 39.0
44	Sabik	103 03.3	−15 40.3
3	Schedar	350 31.9	+56 17.2
45	Shaula	97 22.0	−37 04.4
18	Sirius	259 12.9	−16 39.3
33	Spica	159 17.7	−10 55.6
23	Suhail	223 25.0	−43 15.1
49	Vega	81 08.9	+38 44.1
39	Zub'g'bi	137 54.3	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 10	11	12	13
N °	h m	h m	h m	h m	h m	h m
72	4 05	////	▭	▭	10 59	13 07
70	4 18	////	▭	9 07	11 24	13 19
68	4 29	////	7 05	9 46	11 44	13 28
66	4 37	////	8 14	10 13	11 59	13 36
64	4 45	////	8 49	10 34	12 11	13 43
62	4 51	1 29	9 14	10 50	12 22	13 48
60	4 57	2 02	9 34	11 04	12 30	13 53
58	5 02	2 24	9 51	11 16	12 38	13 58
56	5 06	2 43	10 05	11 26	12 45	14 02
54	5 10	2 57	10 17	11 35	12 51	14 05
52	5 13	3 09	10 27	11 43	12 57	14 08
50	5 17	3 20	10 36	11 50	13 01	14 11
45	5 23	3 40	10 56	12 05	13 12	14 17
40	5 29	3 56	11 12	12 17	13 21	14 22
35	5 34	4 07	11 25	12 28	13 28	14 26
30	5 38	4 17	11 37	12 37	13 35	14 30
20	5 46	4 32	11 57	12 53	13 46	14 37
10	5 52	4 42	12 14	13 07	13 56	14 43
0	5 58	4 49	12 30	13 20	14 05	14 48
10	6 04	4 54	12 46	13 32	14 14	14 53
20	6 10	4 56	13 03	13 46	14 24	14 59
30	6 16	4 56	13 23	14 01	14 35	15 06
35	6 20	4 55	13 34	14 10	14 42	15 09
40	6 24	4 53	13 47	14 21	14 49	15 14
45	6 30	4 51	14 03	14 33	14 57	15 18
50	6 35	4 47	14 21	14 47	15 07	15 24
52	6 38	4 44	14 30	14 54	15 12	15 27
54	6 41	4 41	14 40	15 01	15 17	15 30
56	6 44	4 38	14 51	15 09	15 23	15 33
58	6 48	4 35	15 04	15 19	15 29	15 37
60	6 52	4 31	15 19	15 29	15 36	15 41
S						

Lat.	Sunset	Twlt. ends	Moonset 10	11	12	13
N °	h m	h m	h m	h m	h m	h m
72	20 01	////	▭	▭	5 10	4 33
70	19 47	////	▭	5 24	4 43	4 19
68	19 36	////	5 41	4 44	4 22	4 08
66	19 27	////	4 31	4 16	4 06	3 58
64	19 19	////	3 55	3 54	3 52	3 50
62	19 13	22 44	3 29	3 37	3 41	3 43
60	19 07	22 08	3 08	3 22	3 31	3 37
58	19 02	21 44	2 51	3 10	3 22	3 31
56	18 58	21 26	2 37	2 59	3 15	3 27
54	18 54	21 11	2 24	2 50	3 08	3 22
52	18 50	20 58	2 14	2 41	3 02	3 18
50	18 47	20 47	2 04	2 33	2 56	3 15
45	18 40	20 26	1 43	2 17	2 44	3 07
40	18 34	20 10	1 26	2 03	2 34	3 00
35	18 29	19 57	1 12	1 52	2 25	2 55
30	18 24	19 46	1 00	1 42	2 18	2 50
20	18 17	19 32	0 39	1 24	2 05	2 41
10	18 10	19 21	0 20	1 09	1 53	2 33
0	18 04	19 13	0 03	0 54	1 42	2 26
10	17 59	19 09	24 40	0 40	1 31	2 19
20	17 53	19 06	24 24	0 24	1 19	2 11
30	17 46	19 06	24 06	0 06	1 05	2 02
35	17 42	19 06	23 56	24 57	0 57	1 56
40	17 37	19 07	23 43	24 48	0 48	1 50
45	17 32	19 09	23 29	24 37	0 37	1 43
50	17 26	19 13	23 11	24 24	0 24	1 35
52	17 23	19 15	23 03	24 18	0 18	1 31
54	17 20	19 18	22 54	24 11	0 11	1 27
56	17 17	19 21	22 43	24 04	0 04	1 22
58	17 13	19 24	22 31	23 55	25 17	1 17
60	17 09	19 28	22 17	23 45	25 10	1 10
S						

GMT	Equation of Time (App.—Mean) 10	11	12
h	m s	m s	m s
0	− 1 34.0	− 1 17.7	− 1 01.6
6	− 1 29.9	− 1 13.6	− 0 57.6
12	− 1 25.8	− 1 09.6	− 0 53.7
18	− 1 21.7	− 1 05.6	− 0 49.7
24	− 1 17.7	− 1 01.6	− 0 45.8

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
10	18 42	13 08	4 44	16 10	1 12
11	19 31	13 09	4 42	16 07	1 08
12	20 16	13 10	4 40	16 04	1 04
13	20 58	13 11	4 38	16 01	1 00

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.3	0.1	0.2
30			
	0.3	0.1	0.1
45			
	0.3	0.1	0.1
60			
	0.3	0.0	0.1
75			
	0.3	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	10	11	12
°	′	′	′
0			
	15.3	14.3	13.5
4			
	15.3	14.3	13.5
8			
	15.3	14.3	13.5
12			
	15.3	14.3	13.6
16			
	15.3	14.3	13.6
20			
	15.3	14.4	13.6
24			
	15.3	14.4	13.7
28			
	15.3	14.4	13.7
32			
	15.3	14.4	13.8
36			
	15.3	14.5	13.9
40			
	15.3	14.5	13.9
44			
	15.4	14.6	14.0
48			
	15.4	14.6	14.1
52			
	15.4	14.7	14.2
56			
	15.4	14.7	14.3
60			
	15.4	14.8	14.4
64			
	15.4	14.9	14.5
68			
	15.4	14.9	14.6
72			
	15.4	15.0	14.7
76			
	15.5	15.1	14.8
80			
	15.5	15.1	14.9
84			
	15.5	15.2	15.0
88			
	15.5	15.3	15.1
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	10	11	12
°	′	′	′
0			
	15.7	16.3	16.7
4			
	15.7	16.3	16.7
8			
	15.7	16.3	16.7
12			
	15.7	16.2	16.7
16			
	15.7	16.2	16.6
20			
	15.7	16.2	16.6
24			
	15.7	16.2	16.6
28			
	15.7	16.1	16.5
32			
	15.7	16.1	16.4
36			
	15.7	16.1	16.4
40			
	15.6	16.0	16.3
44			
	15.6	16.0	16.2
48			
	15.6	15.9	16.1
52			
	15.6	15.9	16.1
56			
	15.6	15.8	16.0
60			
	15.6	15.7	15.9
64			
	15.6	15.7	15.8
68			
	15.6	15.6	15.7
72			
	15.6	15.6	15.6
76			
	15.5	15.5	15.4
80			
	15.5	15.4	15.3
84			
	15.5	15.3	15.2
88			
	15.5	15.3	15.1
90			

Subtract from table, back cover

First Quarter 10
Palm Sunday 11

G M T	♈ GHA	VENUS −3.3 GHA	Dec.	MARS −0.2 GHA	Dec.	JUPITER −1.6 GHA	Dec.	SATURN 0.4 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
13 0	200 38.8	162 29.6	+14 42.5	290 31.2	−23 40.5	119 18.3	+23 02.0	345 01.0	−11 19.6	54 27.6	149	+10 28.1	−122
1	215 41.2	177 29.1	43.5	305 32.7	40.6	134 20.3	02.0	0 03.6	19.5	69 01.5	150	10 15.9	−122
2	230 43.7	192 28.6	44.6	320 34.1	40.7	149 22.3	02.1	15 06.3	19.5	83 35.5	150	10 03.7	−122
3	245 46.2	207 28.0	·· 45.7	335 35.6	·· 40.7	164 24.3	·· 02.1	30 08.9	·· 19.4	98 09.5	151	· 9 51.5	−123
4	260 48.6	222 27.5	46.7	350 37.0	40.8	179 26.4	02.1	45 11.6	19.3	112 43.6	151	9 39.2	−123
5	275 51.1	237 27.0	47.8	5 38.5	40.9	194 28.4	02.2	60 14.2	19.3	127 17.7	152	9 26.9	−124
6	290 53.6	252 26.5	+14 48.8	20 40.0	−23 41.0	209 30.4	+23 02.2	75 16.8	−11 19.2	141 51.9	152	+ 9 14.5	−124
7	305 56.0	267 25.9	49.9	35 41.4	41.1	224 32.4	02.2	90 19.5	19.2	156 26.1	153	9 02.1	−124
8	320 58.5	282 25.4	51.0	50 42.9	41.1	239 34.4	02.2	105 22.1	19.1	171 00.4	153	8 49.7	−124
9	336 01.0	297 24.9	·· 52.0	65 44.4	·· 41.2	254 36.4	·· 02.3	120 24.7	·· 19.0	185 34.7	154	· 8 37.3	−124
10	351 03.4	312 24.4	53.1	80 45.8	41.3	269 38.5	02.3	135 27.4	19.0	200 09.1	154	8 24.9	−125
11	6 05.9	327 23.8	54.1	95 47.3	41.4	284 40.5	02.3	150 30.0	18.9	214 43.5	155	8 12.4	−125
12	21 08.3	342 23.3	+14 55.2	110 48.8	−23 41.5	299 42.5	+23 02.4	165 32.7	−11 18.8	229 18.0	155	+ 7 59.9	−126
13	36 10.8	357 22.8	56.2	125 50.2	41.5	314 44.5	02.4	180 35.3	18.8	243 52.5	156	7 47.3	−125
14	51 13.3	12 22.2	57.3	140 51.7	41.6	329 46.5	02.4	195 37.9	18.7	258 27.1	156	7 34.8	−126
15	66 15.7	27 21.7	·· 58.3	155 53.2	·· 41.7	344 48.5	·· 02.5	210 40.6	·· 18.7	273 01.7	156	· 7 22.2	−126
16	81 18.2	42 21.2	14 59.4	170 54.6	41.8	359 50.5	02.5	225 43.2	18.6	287 36.3	157	7 09.6	−126
17	96 20.7	57 20.7	15 00.4	185 56.1	41.9	14 52.6	02.5	240 45.8	18.5	302 11.0	157	6 57.0	−126
18	111 23.1	72 20.1	+15 01.5	200 57.6	−23 41.9	29 54.6	+23 02.5	255 48.5	−11 18.5	316 45.7	158	+ 6 44.4	−127
19	126 25.6	87 19.6	02.5	215 59.1	42.0	44 56.6	02.6	270 51.1	18.4	331 20.5	158	6 31.7	−126
20	141 28.1	102 19.1	03.6	231 00.5	42.1	59 58.6	02.6	285 53.8	18.4	345 55.3	159	6 19.1	−127
21	156 30.5	117 18.5	·· 04.6	246 02.0	·· 42.2	75 00.6	·· 02.6	300 56.4	·· 18.3	0 30.2	158	· 6 06.4	−127
22	171 33.0	132 18.0	05.7	261 03.5	42.2	90 02.6	02.7	315 59.0	18.2	15 05.0	160	5 53.7	−127
23	186 35.5	147 17.5	06.7	276 05.0	42.3	105 04.6	02.7	331 01.7	18.2	29 40.0	159	5 41.0	−128
14 0	201 37.9	162 16.9	+15 07.8	291 06.4	−23 42.4	120 06.6	+23 02.7	346 04.3	−11 18.1	44 14.9	160	+ 5 28.2	−127
1	216 40.4	177 16.4	08.8	306 07.9	42.5	135 08.7	02.8	1 07.0	18.1	58 49.9	160	5 15.5	−128
2	231 42.8	192 15.9	09.9	321 09.4	42.6	150 10.7	02.8	16 09.6	18.0	73 24.9	161	5 02.7	−127
3	246 45.3	207 15.3	·· 10.9	336 10.9	·· 42.6	165 12.7	·· 02.8	31 12.2	·· 17.9	88 00.0	161	· 4 50.0	−128
4	261 47.8	222 14.8	11.9	351 12.3	42.7	180 14.7	02.8	46 14.9	17.9	102 35.1	161	4 37.2	−128
5	276 50.2	237 14.3	13.0	6 13.8	42.8	195 16.7	02.9	61 17.5	17.8	117 10.2	161	4 24.4	−128
6	291 52.7	252 13.7	+15 14.0	21 15.3	−23 42.9	210 18.7	+23 02.9	76 20.1	−11 17.7	131 45.3	162	+ 4 11.6	−128
7	306 55.2	267 13.2	15.1	36 16.8	42.9	225 20.7	02.9	91 22.8	17.7	146 20.5	162	3 58.8	−129
8	321 57.6	282 12.7	16.1	51 18.2	43.0	240 22.7	03.0	106 25.4	17.6	160 55.7	162	3 45.9	−128
9	337 00.1	297 12.1	·· 17.2	66 19.7	·· 43.1	255 24.8	·· 03.0	121 28.1	·· 17.6	175 30.9	162	· 3 33.1	−128
10	352 02.6	312 11.6	18.2	81 21.2	43.2	270 26.8	03.0	136 30.7	17.5	190 06.1	163	3 20.3	−129
11	7 05.0	327 11.1	19.2	96 22.7	43.3	285 28.8	03.1	151 33.3	17.4	204 41.4	163	3 07.4	−128
12	22 07.5	342 10.5	+15 20.3	111 24.2	−23 43.3	300 30.8	+23 03.1	166 36.0	−11 17.4	219 16.7	163	+ 2 54.6	−129
13	37 09.9	357 10.0	21.3	126 25.7	43.4	315 32.8	03.1	181 38.6	17.3	233 52.0	163	2 41.7	−129
14	52 12.4	12 09.4	22.3	141 27.1	43.5	330 34.8	03.1	196 41.3	17.3	248 27.3	164	2 28.8	−128
15	67 14.9	27 08.9	·· 23.4	156 28.6	·· 43.6	345 36.8	·· 03.2	211 43.9	·· 17.2	263 02.7	163	· 2 16.0	−129
16	82 17.3	42 08.4	24.4	171 30.1	43.7	0 38.8	03.2	226 46.5	17.1	277 38.0	164	2 03.1	−129
17	97 19.8	57 07.8	25.5	186 31.6	43.7	15 40.8	03.2	241 49.2	17.1	292 13.4	164	1 50.2	−128
18	112 22.3	72 07.3	+15 26.5	201 33.1	−23 43.8	30 42.8	+23 03.3	256 51.8	−11 17.0	306 48.8	165	+ 1 37.4	−129
19	127 24.7	87 06.7	27.5	216 34.6	43.9	45 44.9	03.3	271 54.5	17.0	321 24.3	164	1 24.5	−129
20	142 27.2	102 06.2	28.6	231 36.1	44.0	60 46.9	03.3	286 57.1	16.9	335 59.7	164	1 11.6	−128
21	157 29.7	117 05.7	·· 29.6	246 37.5	·· 44.0	75 48.9	·· 03.3	301 59.7	·· 16.8	350 35.1	165	· 0 58.8	−129
22	172 32.1	132 05.1	30.6	261 39.0	44.1	90 50.9	03.4	317 02.4	16.8	5 10.6	165	0 45.9	−129
23	187 34.6	147 04.6	31.6	276 40.5	44.2	105 52.9	03.4	332 05.0	16.7	19 46.1	165	0 33.0	−129
15 0	202 37.1	162 04.0	+15 32.7	291 42.0	−23 44.3	120 54.9	+23 03.4	347 07.7	−11 16.6	34 21.6	165	+ 0 20.1	−128
1	217 39.5	177 03.5	33.7	306 43.5	44.4	135 56.9	03.5	2 10.3	16.6	48 57.1	165	+ 0 07.3	−129
2	232 42.0	192 02.9	34.7	321 45.0	44.4	150 58.9	03.5	17 12.9	16.5	63 32.6	165	− 0 05.6	−128
3	247 44.4	207 02.4	·· 35.8	336 46.5	·· 44.5	166 00.9	·· 03.5	32 15.6	·· 16.5	78 08.1	165	· 0 18.4	−129
4	262 46.9	222 01.8	36.8	351 48.0	44.6	181 02.9	03.6	47 18.2	16.4	92 43.6	165	0 31.3	−128
5	277 49.4	237 01.3	37.8	6 49.5	44.7	196 04.9	03.6	62 20.8	16.3	107 19.1	166	0 44.1	−128
6	292 51.8	252 00.8	+15 38.8	21 51.0	−23 44.7	211 06.9	+23 03.6	77 23.5	−11 16.3	121 54.7	165	− 0 56.9	−129
7	307 54.3	267 00.2	39.9	36 52.5	44.8	226 08.9	03.6	92 26.1	16.2	136 30.2	165	1 09.8	−128
8	322 56.8	281 59.7	40.9	51 54.0	44.9	241 10.9	03.7	107 28.8	16.2	151 05.7	166	1 22.6	−128
9	337 59.2	296 59.1	·· 41.9	66 55.5	·· 45.0	256 13.0	·· 03.7	122 31.4	·· 16.1	165 41.3	165	· 1 35.4	−128
10	353 01.7	311 58.6	42.9	81 57.0	45.1	271 15.0	03.7	137 34.0	16.0	180 16.8	166	1 48.2	−128
11	8 04.2	326 58.0	44.0	96 58.4	45.1	286 17.0	03.8	152 36.7	16.0	194 52.4	165	2 01.0	−128
12	23 06.6	341 57.5	+15 45.0	111 59.9	−23 45.2	301 19.0	+23 03.8	167 39.3	−11 15.9	209 27.9	166	− 2 13.8	−127
13	38 09.1	356 56.9	46.0	127 01.4	45.3	316 21.0	03.8	182 42.0	15.9	224 03.5	165	2 26.5	−128
14	53 11.6	11 56.4	47.0	142 02.9	45.4	331 23.0	03.8	197 44.6	15.8	238 39.0	166	2 39.3	−127
15	68 14.0	26 55.8	·· 48.1	157 04.4	·· 45.4	346 25.0	·· 03.9	212 47.2	·· 15.7	253 14.6	165	· 2 52.0	−127
16	83 16.5	41 55.3	49.1	172 05.9	45.5	1 27.0	03.9	227 49.9	15.7	267 50.1	165	3 04.7	−128
17	98 18.9	56 54.7	50.1	187 07.4	45.6	16 29.0	03.9	242 52.5	15.6	282 25.6	166	3 17.5	−127
18	113 21.4	71 54.2	+15 51.1	202 08.9	−23 45.7	31 31.0	+23 04.0	257 55.2	−11 15.5	297 01.2	165	− 3 30.2	−126
19	128 23.9	86 53.6	52.1	217 10.5	45.7	46 33.0	04.0	272 57.8	15.5	311 36.7	165	3 42.8	−127
20	143 26.3	101 53.1	53.1	232 12.0	45.8	61 35.0	04.0	288 00.5	15.4	326 12.2	165	3 55.5	−126
21	158 28.8	116 52.5	·· 54.2	247 13.5	·· 45.9	76 37.0	·· 04.1	303 03.1	·· 15.4	340 47.7	165	· 4 08.1	−127
22	173 31.3	131 52.0	55.2	262 15.0	46.0	91 39.0	04.1	318 05.7	15.3	355 23.2	165	4 20.8	−126
23	188 33.7	146 51.4	56.2	277 16.5	46.1	106 41.0	04.1	333 08.4	15.2	9 58.7	165	4 33.4	−126
24	203 36.2	161 50.9	+15 57.2	292 18.0	−23 46.1	121 43.0	+23 04.1	348 11.0	−11 15.2	24 34.2	164	− 4 46.0	−125
code	−	− 5	+ 10	+ 15	− 1	+ 20	0	+ 26	+ 1				

GMT	h	SUN GHA ° ′		Dec. ° ′
13	0	179 48.6		+ 8 46.2
	1	194 48.8		47.1
	2	209 49.0		48.0
	3	224 49.1	••	48.9
	4	239 49.3		49.8
	5	254 49.4		50.7
	6	269 49.6		+ 8 51.7
	7	284 49.8		52.6
	8	299 49.9		53.5
	9	314 50.1	••	54.4
	10	329 50.3		55.3
	11	344 50.4		56.2
	12	359 50.6		+ 8 57.1
	13	14 50.7		58.0
	14	29 50.9		58.9
	15	44 51.1	•	8 59.8
	16	59 51.2		9 00.7
	17	74 51.4		01.6
	18	89 51.5		+ 9 02.5
	19	104 51.7		03.5
	20	119 51.9		04.4
	21	134 52.0	••	05.3
	22	149 52.2		06.2
	23	164 52.3		07.1
14	0	179 52.5		+ 9 08.0
	1	194 52.7		08.9
	2	209 52.8		09.8
	3	224 53.0	••	10.7
	4	239 53.1		11.6
	5	254 53.3		12.5
	6	269 53.5		+ 9 13.4
	7	284 53.6		14.3
	8	299 53.8		15.2
	9	314 53.9	••	16.1
	10	329 54.1		17.0
	11	344 54.3		17.9
	12	359 54.4		+ 9 18.8
	13	14 54.6		19.7
	14	29 54.7		20.6
	15	44 54.9	••	21.5
	16	59 55.0		22.4
	17	74 55.2		23.3
	18	89 55.4		+ 9 24.2
	19	104 55.5		25.1
	20	119 55.7		26.0
	21	134 55.8	••	26.9
	22	149 56.0		27.8
	23	164 56.1		28.7
15	0	179 56.3		+ 9 29.6
	1	194 56.5		30.5
	2	209 56.6		31.4
	3	224 56.8	••	32.3
	4	239 56.9		33.2
	5	254 57.1		34.1
	6	269 57.2		+ 9 35.0
	7	284 57.4		35.9
	8	299 57.5		36.8
	9	314 57.7	••	37.7
	10	329 57.9		38.6
	11	344 58.0		39.5
	12	359 58.2		+ 9 40.4
	13	14 58.3		41.3
	14	29 58.5		42.2
	15	44 58.6	••	43.1
	16	59 58.8		44.0
	17	74 58.9		44.8
	18	89 59.1		+ 9 45.7
	19	104 59.2		46.6
	20	119 59.4		47.5
	21	134 59.6	••	48.4
	22	149 59.7		49.3
	23	164 59.9		50.2
	24	180 00.0		+ 9 51.1
code		—		+ 9

No.	STARS Name	SHA ° ′	Dec. ° ′
7	Acamar	315 52.3	−40 29.3
5	Achernar	336 00.1	−57 28.0
30	Acrux	173 58.5	−62 51.0
19	Adhara	255 47.5	−28 54.7
10	Aldebaran	291 40.6	+16 25.2
32	Alioth	166 58.8	+56 12.3
34	Alkaid	153 33.2	+49 32.3
55	Al Na'ir	28 39.5	−47 10.8
15	Alnilam	276 31.6	− 1 13.8
25	Alphard	218 39.5	− 8 27.8
41	Alphecca	126 48.2	+26 51.8
1	Alpheratz	358 29.8	+28 50.2
51	Altair	62 51.5	+ 8 44.6
2	Ankaa	353 59.7	−42 33.2
42	Antares	113 20.5	−26 20.0
37	Arcturus	146 35.8	+19 24.9
43	Atria	109 01.9	−68 56.7
22	Avior	234 36.2	−59 22.0
13	Bellatrix	279 19.8	+ 6 18.6
16	Betelg'se	271 49.5	+ 7 24.0
17	Canopus	264 16.0	−52 40.5
12	Capella	281 40.3	+45 57.4
53	Deneb	50 01.9	+45 06.7
28	Denebola	183 18.5	+14 49.5
4	Diphda	349 40.6	−18 14.2
27	Dubhe	194 45.3	+61 59.9
14	Elnath	279 08.9	+28 34.3
47	Eltanin	91 06.5	+51 29.3
54	Enif	34 30.8	+ 9 39.8
56	Fomalhaut	16 13.0	−29 51.8
31	Gacrux	172 50.0	−56 51.7
29	Gienah	176 37.7	−17 17.6
35	Hadar	149 50.5	−60 09.4
6	Hamal	328 51.3	+23 14.8
48	Kaus Aust.	84 42.5	−34 24.5
40	Kochab	137 16.5	+74 20.3
57	Markab	14 22.8	+14 57.5
8	Menkar	315 01.8	+ 3 54.7
36	Menkent	148 59.6	−36 09.0
24	Miapl'dus	221 49.1	−69 32.1
9	Mirfak	309 44.5	+49 42.1
50	Nunki	76 53.2	−26 21.3
52	Peacock	54 29.0	−56 52.8
21	Pollux	244 21.9	+28 08.3
20	Procyon	245 46.1	+ 5 20.5
46	R'alhague	96 47.5	+12 35.3
26	Regulus	208 30.5	+12 11.4
11	Rigel	281 54.9	− 8 15.3
38	Rigil Kent.	140 52.0	−60 39.1
44	Sabik	103 03.2	−15 40.3
3	Schedar	350 31.9	+56 17.2
45	Shaula	97 22.0	−37 04.4
18	Sirius	259 12.9	−16 39.3
33	Spica	159 17.7	−10 55.6
23	Suhail	223 25.0	−43 15.2
49	Vega	81 08.9	+38 44.1
39	Zub'g'bi	137 54.3	−15 51.4

Lat. °	Sunrise h m	Twlt. begins h m	Moonrise 13 h m	14 h m	15 h m	16 h m
N 72	3 48	////	13 07	15 01	16 52	18 45
70	4 03	////	13 19	15 04	16 47	18 31
68	4 16	////	13 28	15 07	16 43	18 20
66	4 26	////	13 36	15 09	16 40	18 11
64	4 34	////	13 43	15 11	16 37	18 03
62	4 42	0 59	13 48	15 12	16 35	17 57
60	4 48	1 43	13 53	15 14	16 32	17 51
58	4 53	2 10	13 58	15 15	16 31	17 47
56	4 58	2 30	14 02	15 16	16 29	17 42
54	5 03	2 46	14 05	15 17	16 28	17 38
52	5 07	3 00	14 08	15 18	16 26	17 35
50	5 10	3 11	14 11	15 18	16 25	17 32
45	5 18	3 33	14 17	15 20	16 22	17 25
40	5 25	3 50	14 22	15 22	16 20	17 19
35	5 30	4 02	14 26	15 23	16 18	17 14
30	5 35	4 13	14 30	15 24	16 17	17 10
20	5 43	4 29	14 37	15 26	16 14	17 02
10	5 50	4 40	14 43	15 27	16 12	16 56
0	5 57	4 47	14 48	15 29	16 09	16 50
10	6 04	4 54	14 53	15 31	16 07	16 44
20	6 11	4 56	14 59	15 32	16 05	16 37
30	6 18	4 58	15 06	15 34	16 02	16 30
35	6 23	4 58	15 09	15 35	16 01	16 26
40	6 28	4 57	15 14	15 37	15 59	16 22
45	6 33	4 54	15 18	15 38	15 57	16 16
50	6 40	4 52	15 24	15 40	15 55	16 10
52	6 43	4 50	15 27	15 40	15 53	16 07
54	6 47	4 47	15 30	15 41	15 52	16 04
56	6 50	4 44	15 33	15 42	15 51	16 00
58	6 55	4 41	15 37	15 43	15 50	15 56
S 60	6 59	4 38	15 41	15 44	15 48	15 52

Lat. °	Sunset h m	Twlt. ends h m	Moonset 13 h m	14 h m	15 h m	16 h m
N 72	20 17	////	4 33	4 06	3 42	3 18
70	20 01	////	4 19	4 00	3 42	3 25
68	19 48	////	4 08	3 55	3 43	3 31
66	19 37	////	3 58	3 51	3 44	3 36
64	19 28	////	3 50	3 47	3 44	3 41
62	19 21	23 17	3 43	3 44	3 44	3 45
60	19 15	22 27	3 37	3 41	3 45	3 48
58	19 09	21 57	3 31	3 39	3 45	3 51
56	19 04	21 36	3 27	3 36	3 45	3 54
54	18 59	21 19	3 22	3 34	3 45	3 57
52	18 55	21 05	3 18	3 33	3 46	3 59
50	18 51	20 53	3 15	3 31	3 46	4 01
45	18 44	20 31	3 07	3 27	3 46	4 05
40	18 37	20 14	3 00	3 24	3 47	4 09
35	18 31	20 00	2 55	3 21	3 47	4 12
30	18 26	19 49	2 50	3 19	3 47	4 15
20	18 18	19 33	2 41	3 15	3 48	4 20
10	18 10	19 21	2 33	3 11	3 48	4 25
0	18 04	19 14	2 26	3 08	3 48	4 29
10	17 57	19 07	2 19	3 04	3 49	4 33
20	17 50	19 04	2 11	3 01	3 49	4 37
30	17 42	19 02	2 02	2 56	3 49	4 42
35	17 38	19 02	1 56	2 54	3 50	4 45
40	17 33	19 03	1 50	2 51	3 50	4 49
45	17 27	19 05	1 43	2 48	3 50	4 52
50	17 20	19 08	1 35	2 44	3 51	4 57
52	17 17	19 09	1 31	2 42	3 51	4 59
54	17 13	19 11	1 27	2 40	3 51	5 02
56	17 10	19 14	1 22	2 37	3 51	5 04
58	17 05	19 16	1 17	2 35	3 51	5 07
S 60	17 00	19 19	1 10	2 32	3 52	5 10

GMT h	Equation of Time (App.—Mean) 13 m s	14 m s	15 m s
0	− 0 45.8	− 0 30.3	− 0 15.1
6	− 0 41.9	− 0 26.5	− 0 11.4
12	− 0 38.0	− 0 22.7	− 0 07.6
18	− 0 34.1	− 0 18.9	− 0 03.9
24	− 0 30.3	− 0 15.1	− 0 00.3

GMT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
13	20 58	13 11	4 38	16 01	1 00
14	21 39	13 11	4 35	15 57	0 56
15	22 19	13 12	4 33	15 54	0 51
16	23 00	13 13	4 30	15 51	0 47

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0			
	0.3	0.1	0.2
30			
	0.3	0.1	0.1
45			
	0.3	0.1	0.1
60			
	0.3	0.0	0.1
75			
	0.3	0.0	0.0
90			

Moon's Lower Limb Add

Alt. °	13 ′	14 ′	15 ′
0			
	12.9	12.4	12.0
4			
	12.9	12.4	12.0
8			
	12.9	12.4	12.0
12			
	12.9	12.4	12.1
16			
	13.0	12.5	12.1
20			
	13.0	12.6	12.2
24			
	13.1	12.6	12.3
28			
	13.2	12.7	12.4
32			
	13.2	12.8	12.5
36			
	13.3	12.9	12.6
40			
	13.4	13.0	12.7
44			
	13.5	13.1	12.8
48			
	13.6	13.3	13.0
52			
	13.7	13.4	13.1
56			
	13.9	13.5	13.3
60			
	14.0	13.7	13.5
64			
	14.1	13.9	13.6
68			
	14.3	14.0	13.8
72			
	14.4	14.2	14.0
76			
	14.5	14.4	14.2
80			
	14.7	14.5	14.4
84			
	14.8	14.7	14.6
88			
	14.9	14.8	14.7
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt. °	13 ′	14 ′	15 ′
0			
	17.1	17.4	17.6
4			
	17.1	17.4	17.6
8			
	17.0	17.3	17.5
12			
	17.0	17.3	17.5
16			
	17.0	17.2	17.5
20			
	16.9	17.2	17.4
24			
	16.9	17.1	17.3
28			
	16.8	17.0	17.2
32			
	16.7	16.9	17.1
36			
	16.6	16.8	17.0
40			
	16.5	16.7	16.9
44			
	16.4	16.6	16.7
48			
	16.3	16.5	16.6
52			
	16.2	16.3	16.4
56			
	16.1	16.2	16.3
60			
	16.0	16.0	16.1
64			
	15.8	15.9	15.9
68			
	15.7	15.7	15.7
72			
	15.6	15.6	15.6
76			
	15.4	15.4	15.4
80			
	15.3	15.2	15.2
84			
	15.1	15.0	15.0
88			
	15.0	14.9	14.8
90			

Subtract from table, back cover

G.M.T.		♈ GHA	VENUS −3.3 GHA	VENUS Dec.	MARS −0.3 GHA	MARS Dec.	JUPITER −1.6 GHA	JUPITER Dec.	SATURN 0.4 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
16	0	203 36.2	161 50.9	+15 57.2	292 18.0	−23 46.1	121 43.0	+23 04.1	348 11.0	−11 15.2	24 34.2	164	− 4 46.0	−125
	1	218 38.7	176 50.3	58.2	307 19.5	46.2	136 45.0	04.2	3 13.7	15.1	39 09.6	165	4 58.5	−126
	2	233 41.1	191 49.7	15 59.2	322 21.0	46.3	151 47.0	04.2	18 16.3	15.1	53 45.1	164	5 11.1	−125
	3	248 43.6	206 49.2	·16 00.2	337 22.5	·· 46.4	166 49.0	·· 04.2	33 18.9	·· 15.0	68 20.5	165	· 5 23.6	−125
	4	263 46.0	221 48.6	01.3	352 24.0	46.4	181 51.0	04.3	48 21.6	14.9	82 56.0	164	5 36.1	−125
	5	278 48.5	236 48.1	02.3	7 25.5	46.5	196 53.0	04.3	63 24.2	14.9	97 31.4	164	5 48.6	−124
	6	293 51.0	251 47.5	+16 03.3	22 27.0	−23 46.6	211 55.0	+23 04.3	78 26.9	−11 14.8	112 06.8	164	− 6 01.0	−125
	7	308 53.4	266 47.0	04.3	37 28.5	46.7	226 57.0	04.3	93 29.5	14.7	126 42.2	163	6 13.5	−124
	8	323 55.9	281 46.4	05.3	52 30.1	46.7	241 59.0	04.4	108 32.1	14.7	141 17.5	164	6 25.9	−123
	9	338 58.4	296 45.9	·· 06.3	67 31.6	·· 46.8	257 01.0	·· 04.4	123 34.8	·· 14.6	155 52.9	163	· 6 38.2	−124
	10	354 00.8	311 45.3	07.3	82 33.1	46.9	272 03.0	04.4	138 37.4	14.6	170 28.2	163	6 50.6	−123
	11	9 03.3	326 44.7	08.3	97 34.6	47.0	287 05.1	04.5	153 40.1	14.5	185 03.5	163	7 02.9	−123
	12	24 05.8	341 44.2	+16 09.3	112 36.1	−23 47.1	302 07.0	+23 04.5	168 42.7	−11 14.4	199 38.8	163	− 7 15.2	−123
	13	39 08.2	356 43.6	10.3	127 37.6	47.1	317 09.1	04.5	183 45.3	14.4	214 14.1	162	7 27.5	−122
	14	54 10.7	11 43.1	11.3	142 39.1	47.2	332 11.1	04.5	198 48.0	14.3	228 49.3	163	7 39.7	−122
	15	69 13.2	26 42.5	·· 12.3	157 40.7	·· 47.3	347 13.1	·· 04.6	213 50.6	·· 14.3	243 24.6	162	· 7 51.9	−122
	16	84 15.6	41 41.9	13.3	172 42.2	47.4	2 15.1	04.6	228 53.3	14.2	257 59.8	161	8 04.1	−121
	17	99 18.1	56 41.4	14.3	187 43.7	47.4	17 17.1	04.6	243 55.9	14.1	272 34.9	162	8 16.2	−121
	18	114 20.5	71 40.8	+16 15.3	202 45.2	−23 47.5	32 19.1	+23 04.7	258 58.6	−11 14.1	287 10.1	161	− 8 28.3	−121
	19	129 23.0	86 40.3	16.3	217 46.7	47.6	47 21.1	04.7	274 01.2	14.0	301 45.2	161	8 40.4	−121
	20	144 25.5	101 39.7	17.3	232 48.2	47.7	62 23.1	04.7	289 03.8	13.9	316 20.3	161	8 52.5	−120
	21	159 27.9	116 39.1	·· 18.3	247 49.8	·· 47.7	77 25.1	·· 04.8	304 06.5	·· 13.9	330 55.4	160	· 9 04.5	−120
	22	174 30.4	131 38.6	19.3	262 51.3	47.8	92 27.0	04.8	319 09.1	13.8	345 30.4	160	9 16.5	−119
	23	189 32.9	146 38.0	20.3	277 52.8	47.9	107 29.0	04.8	334 11.8	13.8	0 05.4	160	9 28.4	−119
17	0	204 35.3	161 37.4	+16 21.3	292 54.3	−23 48.0	122 31.0	+23 04.8	349 14.4	−11 13.7	14 40.4	160	− 9 40.3	−119
	1	219 37.8	176 36.9	22.3	307 55.9	48.0	137 33.0	04.9	4 17.1	13.6	29 15.4	159	9 52.2	−118
	2	234 40.3	191 36.3	23.3	322 57.4	48.1	152 35.0	04.9	19 19.7	13.6	43 50.3	159	10 04.0	−118
	3	249 42.7	206 35.7	·· 24.3	337 58.9	·· 48.2	167 37.0	·· 04.9	34 22.3	·· 13.5	58 25.2	158	·10 15.8	−117
	4	264 45.2	221 35.2	25.3	353 00.4	48.3	182 39.0	05.0	49 25.0	13.4	73 00.0	158	10 27.5	−117
	5	279 47.7	236 34.6	26.3	8 02.0	48.4	197 41.0	05.0	64 27.6	13.4	87 34.8	158	10 39.2	−117
	6	294 50.1	251 34.0	+16 27.3	23 03.5	−23 48.4	212 43.0	+23 05.0	79 30.3	−11 13.3	102 09.6	158	−10 50.9	−116
	7	309 52.6	266 33.5	28.3	38 05.0	48.5	227 45.0	05.0	94 32.9	13.3	116 44.4	157	11 02.5	−116
	8	324 55.0	281 32.9	29.3	53 06.5	48.6	242 47.0	05.1	109 35.5	13.2	131 19.1	157	11 14.1	−115
	9	339 57.5	296 32.3	·· 30.3	68 08.1	·· 48.7	257 49.0	·· 05.1	124 38.2	·· 13.1	145 53.8	156	·11 25.6	−115
	10	355 00.0	311 31.8	31.3	83 09.6	48.7	272 51.0	05.1	139 40.8	13.1	160 28.4	156	11 37.1	−114
	11	10 02.4	326 31.2	32.2	98 11.1	48.8	287 53.0	05.2	154 43.5	13.0	175 03.0	156	11 48.5	−114
	12	25 04.9	341 30.6	+16 33.2	113 12.7	−23 48.9	302 55.0	+23 05.2	169 46.1	−11 13.0	189 37.6	155	−11 59.9	−114
	13	40 07.4	356 30.1	34.2	128 14.2	49.0	317 57.0	05.2	184 48.8	12.9	204 12.1	155	12 11.3	−113
	14	55 09.8	11 29.5	35.2	143 15.7	49.0	332 59.0	05.2	199 51.4	12.8	218 46.6	155	12 22.6	−112
	15	70 12.3	26 28.9	·· 36.2	158 17.2	·· 49.1	348 01.0	·· 05.3	214 54.0	·· 12.8	233 21.1	154	·12 33.8	−113
	16	85 14.8	41 28.3	37.2	173 18.8	49.2	3 03.0	05.3	229 56.7	12.7	247 55.5	154	12 45.1	−111
	17	100 17.2	56 27.8	38.2	188 20.3	49.3	18 05.0	05.3	244 59.3	12.6	262 29.9	153	12 56.2	−111
	18	115 19.7	71 27.2	+16 39.2	203 21.8	−23 49.3	33 07.0	+23 05.4	260 02.0	−11 12.6	277 04.2	153	−13 07.3	−111
	19	130 22.1	86 26.6	40.1	218 23.4	49.4	48 09.0	05.4	275 04.6	12.5	291 38.5	152	13 18.4	−110
	20	145 24.6	101 26.1	41.1	233 24.9	49.5	63 11.0	05.4	290 07.3	12.5	306 12.7	152	13 29.4	−109
	21	160 27.1	116 25.5	·· 42.1	248 26.5	·· 49.6	78 13.0	·· 05.4	305 09.9	·· 12.4	320 46.9	152	·13 40.3	−109
	22	175 29.5	131 24.9	43.1	263 28.0	49.7	93 15.0	05.5	320 12.5	12.3	335 21.1	151	13 51.2	−109
	23	190 32.0	146 24.3	44.1	278 29.5	49.7	108 17.0	05.5	335 15.2	12.3	349 55.2	150	14 02.1	−107
18	0	205 34.5	161 23.8	+16 45.0	293 31.1	−23 49.8	123 19.0	+23 05.5	350 17.8	−11 12.2	4 29.2	150	−14 12.8	−108
	1	220 36.9	176 23.2	46.0	308 32.6	49.9	138 21.0	05.6	5 20.5	12.2	19 03.2	150	14 23.6	−106
	2	235 39.4	191 22.6	47.0	323 34.2	50.0	153 23.0	05.6	20 23.1	12.1	33 37.2	149	14 34.2	−107
	3	250 41.9	206 22.0	·· 48.0	338 35.7	·· 50.0	168 24.9	·· 05.6	35 25.8	·· 12.0	48 11.1	149	·14 44.9	−105
	4	265 44.3	221 21.4	49.0	353 37.2	50.1	183 26.9	05.6	50 28.4	12.0	62 45.0	148	14 55.4	−105
	5	280 46.8	236 20.9	49.9	8 38.8	50.2	198 28.9	05.7	65 31.0	11.9	77 18.8	148	15 05.9	−105
	6	295 49.3	251 20.3	+16 50.9	23 40.3	−23 50.3	213 30.9	+23 05.7	80 33.7	−11 11.8	91 52.6	147	−15 16.4	−103
	7	310 51.7	266 19.7	51.9	38 41.9	50.3	228 32.9	05.7	95 36.3	11.8	106 26.3	147	15 26.7	−104
	8	325 54.2	281 19.1	52.8	53 43.4	50.4	243 34.9	05.8	110 39.0	11.7	121 00.0	146	15 37.1	−102
	9	340 56.6	296 18.6	·· 53.8	68 45.0	·· 50.5	258 36.9	·· 05.8	125 41.6	·· 11.7	135 33.6	146	·15 47.3	−102
	10	355 59.1	311 18.0	54.8	83 46.5	50.6	273 38.9	05.8	140 44.3	11.6	150 07.2	146	15 57.5	−101
	11	11 01.6	326 17.4	55.8	98 48.0	50.6	288 40.9	05.8	155 46.9	11.5	164 40.8	144	16 07.6	−101
	12	26 04.0	341 16.8	+16 56.7	113 49.6	−23 50.7	303 42.9	+23 05.9	170 49.5	−11 11.5	179 14.2	144	−16 17.7	−100
	13	41 06.5	356 16.2	57.7	128 51.1	50.8	318 44.9	05.9	185 52.2	11.4	193 47.6	144	16 27.7	− 99
	14	56 09.0	11 15.6	58.7	143 52.7	50.9	333 46.9	05.9	200 54.8	11.3	208 21.0	143	16 37.6	− 99
	15	71 11.4	26 15.1	·16 59.6	158 54.2	·· 50.9	348 48.9	·· 06.0	215 57.5	·· 11.3	222 54.3	143	·16 47.5	− 98
	16	86 13.9	41 14.5	17 00.6	173 55.8	51.0	3 50.8	06.0	231 00.1	11.2	237 27.6	142	16 57.3	− 97
	17	101 16.4	56 13.9	01.6	188 57.3	51.1	18 52.8	06.0	246 02.8	11.2	252 00.8	142	17 07.0	− 97
	18	116 18.8	71 13.3	+17 02.5	203 58.9	−23 51.2	33 54.8	+23 06.0	261 05.4	−11 11.1	266 34.0	141	−17 16.7	− 95
	19	131 21.3	86 12.7	03.5	219 00.5	51.3	48 56.8	06.1	276 08.0	11.0	281 07.1	140	17 26.2	− 96
	20	146 23.7	101 12.1	04.5	234 02.0	51.3	63 58.8	06.1	291 10.7	11.0	295 40.1	140	17 35.8	− 94
	21	161 26.2	116 11.6	·· 05.4	249 03.6	·· 51.4	79 00.8	·· 06.1	306 13.3	·· 10.9	310 13.1	139	·17 45.2	− 94
	22	176 28.7	131 11.0	06.4	264 05.1	51.5	94 02.8	06.2	321 16.0	10.9	324 46.0	139	17 54.6	− 93
	23	191 31.1	146 10.4	07.4	279 06.7	51.6	109 04.8	06.2	336 18.6	10.8	339 18.9	138	18 03.9	− 92
	24	206 33.6	161 09.8	+17 08.3	294 08.2	−23 51.6	124 06.8	+23 06.2	351 21.3	−11 10.7	353 51.7	138	−18 13.1	− 91
code		—	− 5	+ 10	+ 15	− 1	+ 20	0	+ 27	+ 1				

Day	GMT h	SUN GHA ° ′	SUN Dec ° ′
16	0	180 00.0	+ 9 51.1
	1	195 00.2	52.0
	2	210 00.3	52.9
	3	225 00.5 ••	53.8
	4	240 00.6	54.7
	5	255 00.8	55.5
	6	270 00.9	+ 9 56.4
	7	285 01.1	57.3
	8	300 01.2	58.2
	9	315 01.4 •	9 59.1
	10	330 01.5	10 00.0
	11	345 01.7	00.9
	12	0 01.8	+10 01.8
	13	15 02.0	02.7
	14	30 02.1	03.5
	15	45 02.3 ••	04.4
	16	60 02.4	05.3
	17	75 02.6	06.2
	18	90 02.7	+10 07.1
	19	105 02.9	08.0
	20	120 03.0	08.9
	21	135 03.2 ••	09.8
	22	150 03.3	10.6
	23	165 03.5	11.5
17	0	180 03.6	+10 12.4
	1	195 03.8	13.3
	2	210 03.9	14.2
	3	225 04.1 ••	15.1
	4	240 04.2	15.9
	5	255 04.4	16.8
	6	270 04.5	+10 17.7
	7	285 04.7	18.6
	8	300 04.8	19.5
	9	315 05.0 ••	20.4
	10	330 05.1	21.2
	11	345 05.3	22.1
	12	0 05.4	+10 23.0
	13	15 05.6	23.9
	14	30 05.7	24.8
	15	45 05.9 ••	25.6
	16	60 06.0	26.5
	17	75 06.2	27.4
	18	90 06.3	+10 28.3
	19	105 06.4	29.2
	20	120 06.6	30.0
	21	135 06.7 ••	30.9
	22	150 06.9	31.8
	23	165 07.0	32.7
18	0	180 07.2	+10 33.6
	1	195 07.3	34.4
	2	210 07.5	35.3
	3	225 07.6 ••	36.2
	4	240 07.8	37.1
	5	255 07.9	37.9
	6	270 08.0	+10 38.8
	7	285 08.2	39.7
	8	300 08.3	40.6
	9	315 08.5 ••	41.4
	10	330 08.6	42.3
	11	345 08.8	43.2
	12	0 08.9	+10 44.1
	13	15 09.0	44.9
	14	30 09.2	45.8
	15	45 09.3 ••	46.7
	16	60 09.5	47.6
	17	75 09.6	48.4
	18	90 09.8	+10 49.3
	19	105 09.9	50.2
	20	120 10.0	51.0
	21	135 10.2 ••	51.9
	22	150 10.3	52.8
	23	165 10.5	53.7
	24	180 10.6	+10 54.5
code		—	+ 9

STARS No	Name	SHA ° ′	Dec. ° ′
7	Acamar	315 52.3	−40 29.3
5	Achernar	336 00.1	−57 28.0
30	Acrux	173 58.6	−62 51.0
19	Adhara	255 47.5	−28 54.7
10	Aldebaran	291 40.6	+16 25.2
32	Alioth	166 58.8	+56 12.4
34	Alkaid	153 33.2	+49 32.3
55	Al Na'ir	28 39.5	−47 10.8
15	Alnilam	276 31.6	− 1 13.8
25	Alphard	218 39.6	− 8 27.8
41	Alphecca	126 48.2	+26 51.8
1	Alpheratz	358 29.8	+28 50.2
51	Altair	62 51.5	+ 8 44.6
2	Ankaa	353 59.7	−42 33.1
42	Antares	113 20.4	−26 20.1
37	Arcturus	146 35.8	+19 24.9
43	Atria	109 01.8	−68 56.7
22	Avior	234 36.2	−59 22.1
13	Bellatrix	279 19.8	+ 6 18.6
16	Betelg'se	271 49.5	+ 7 24.0
17	Canopus	264 16.1	−52 40.5
12	Capella	281 40.4	+45 57.4
53	Deneb	50 01.9	+45 06.7
28	Denebola	183 18.5	+14 49.5
4	Diphda	349 40.6	−18 14.2
27	Dubhe	194 45.3	+61 59.9
14	Elnath	279 08.9	+28 34.3
47	Eltanin	91 06.5	+51 29.3
54	Enif	34 30.8	+ 9 39.8
56	Fomalhaut	16 13.0	−29 51.8
31	Gacrux	172 50.0	−56 51.7
29	Gienah	176 37.7	−17 17.6
35	Hadar	149 50.5	−60 09.4
6	Hamal	328 51.3	+23 14.8
48	Kaus Aust.	84 42.5	−34 24.5
40	Kochab	137 16.5	+74 20.3
57	Markab	14 22.8	+14 57.5
8	Menkar	315 01.8	+ 3 54.7
36	Menkent	148 59.6	−36 09.0
24	Miapl'dus	221 49.1	−69 32.1
9	Mirfak	309 44.5	+49 42.1
50	Nunki	76 53.1	−26 21.3
52	Peacock	54 29.0	−56 52.8
21	Pollux	244 21.9	+28 08.3
20	Procyon	245 46.2	+ 5 20.5
46	R'alhague	96 47.4	+12 35.3
26	Regulus	208 30.5	+12 11.4
11	Rigel	281 54.9	− 8 15.3
38	Rigil Kent.	140 51.9	−60 39.1
44	Sabik	103 03.2	−15 40.3
3	Schedar	350 31.9	+56 17.2
45	Shaula	97 21.9	−37 04.4
18	Sirius	259 12.9	−16 39.3
33	Spica	159 17.7	−10 55.6
23	Suhail	223 25.1	−43 15.2
49	Vega	81 08.9	+38 44.1
39	Zub'g'bi	137 54.3	−15 51.4

Lat. °	Sunrise h m	Twlt. begins h m	Moonrise 16 h m	Moonrise 17 h m	Moonrise 18 h m	Moonrise 19 h m
N 72	3 30	////	18 45	20 52	■	■
70	3 48	////	18 31	20 23	22 37	■
68	4 03	////	18 20	20 02	21 54	24 27
66	4 14	////	18 11	19 46	21 26	23 17
64	4 24	////	18 03	19 32	21 05	22 41
62	4 32	////	17 57	19 21	20 47	22 16
60	4 39	1 21	17 51	19 12	20 33	21 56
58	4 45	1 54	17 47	19 03	20 21	21 39
56	4 51	2 17	17 42	18 56	20 11	21 26
54	4 56	2 35	17 38	18 50	20 02	21 14
52	5 00	2 50	17 35	18 44	19 54	21 03
50	5 04	3 02	17 32	18 39	19 46	20 54
45	5 13	3 27	17 25	18 27	19 31	20 34
40	5 20	3 45	17 19	18 18	19 18	20 18
35	5 26	3 59	17 14	18 10	19 07	20 05
30	5 32	4 10	17 10	18 03	18 58	19 53
20	5 41	4 26	17 02	17 51	18 42	19 33
10	5 49	4 38	16 56	17 41	18 28	19 16
0	5 56	4 47	16 50	17 31	18 15	19 00
10	6 04	4 53	16 44	17 22	18 02	18 44
20	6 11	4 57	16 37	17 12	17 48	18 27
30	6 20	4 59	16 30	17 00	17 32	18 08
35	6 25	5 00	16 26	16 53	17 23	17 57
40	6 31	5 00	16 22	16 46	17 13	17 44
45	6 37	4 58	16 16	16 37	17 01	17 29
50	6 45	4 55	16 10	16 27	16 46	17 10
52	6 48	4 55	16 07	16 22	16 39	17 01
54	6 52	4 52	16 04	16 17	16 32	16 52
56	6 57	4 51	16 00	16 11	16 24	16 41
58	7 01	4 48	15 56	16 04	16 14	16 28
60	7 07	4 45	15 52	15 57	16 04	16 14
S						

Lat. °	Sunset h m	Twlt. ends h m	Moonset 16 h m	Moonset 17 h m	Moonset 18 h m	Moonset 19 h m
N 72	20 33	////	3 18	2 50	2 11	■
70	20 14	////	3 25	3 06	2 41	1 57
68	20 00	////	3 31	3 19	3 03	2 41
66	19 48	////	3 36	3 29	3 21	3 11
64	19 38	////	3 41	3 38	3 36	3 33
62	19 29	////	3 45	3 46	3 48	3 51
60	19 22	22 49	3 48	3 53	3 58	4 06
58	19 15	22 11	3 51	3 59	4 07	4 19
56	19 10	21 48	3 54	4 04	4 15	4 30
54	19 05	21 29	3 57	4 09	4 23	4 40
52	19 00	21 13	3 59	4 13	4 29	4 48
50	18 56	21 01	4 01	4 17	4 35	4 56
45	18 47	20 36	4 05	4 25	4 47	5 13
40	18 40	20 18	4 09	4 32	4 58	5 27
35	18 34	20 04	4 12	4 39	5 07	5 38
30	18 28	19 52	4 15	4 44	5 15	5 49
20	18 19	19 35	4 20	4 53	5 29	6 06
10	18 11	19 22	4 25	5 02	5 41	6 22
0	18 03	19 13	4 29	5 10	5 52	6 36
10	17 56	19 07	4 33	5 18	6 03	6 51
20	17 48	19 02	4 37	5 26	6 15	7 06
30	17 39	18 59	4 42	5 36	6 29	7 24
35	17 34	18 58	4 45	5 41	6 38	7 35
40	17 28	18 58	4 49	5 47	6 47	7 47
45	17 22	19 00	4 52	5 55	6 58	8 01
50	17 14	19 02	4 57	6 04	7 11	8 19
52	17 10	19 03	4 59	6 08	7 17	8 27
54	17 06	19 04	5 02	6 12	7 24	8 36
56	17 02	19 06	5 04	6 18	7 32	8 47
58	16 57	19 08	5 07	6 23	7 41	8 59
60	16 52	19 11	5 10	6 30	7 50	9 12
S						

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0			
	0.3	0.1	0.2
30			
	0.3	0.1	0.1
45			
	0.3	0.1	0.1
60			
	0.3	0.0	0.1
75			
	0.3	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt. °	16 ′	17 ′	18 ′
0			
	11.7	11.7	11.7
4			
	11.7	11.7	11.7
8			
	11.8	11.8	11.8
12			
	11.8	11.8	11.8
16			
	11.9	11.9	11.9
20			
	12.0	12.0	12.0
24			
	12.0	12.0	12.0
28			
	12.1	12.1	12.1
32			
	12.2	12.2	12.2
36			
	12.4	12.4	12.4
40			
	12.5	12.5	12.5
44			
	12.6	12.6	12.6
48			
	12.8	12.8	12.8
52			
	13.0	13.0	13.0
56			
	13.1	13.1	13.1
60			
	13.3	13.3	13.3
64			
	13.5	13.5	13.5
68			
	13.7	13.7	13.7
72			
	13.9	13.9	13.9
76			
	14.1	14.1	14.1
80			
	14.3	14.3	14.3
84			
	14.5	14.5	14.5
88			
	14.7	14.7	14.7
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt. °	16 ′	17 ′	18 ′
0			
	17.7	17.7	17.7
4			
	17.7	17.7	17.7
8			
	17.7	17.7	17.7
12			
	17.6	17.6	17.6
16			
	17.6	17.6	17.6
20			
	17.5	17.5	17.5
24			
	17.4	17.4	17.4
28			
	17.3	17.3	17.3
32			
	17.2	17.2	17.2
36			
	17.1	17.1	17.1
40			
	17.0	17.0	17.0
44			
	16.8	16.8	16.8
48			
	16.7	16.7	16.7
52			
	16.5	16.5	16.5
56			
	16.3	16.3	16.3
60			
	16.1	16.1	16.1
64			
	16.0	16.0	16.0
68			
	15.8	15.8	15.8
72			
	15.6	15.6	15.6
76			
	15.4	15.4	15.4
80			
	15.2	15.2	15.2
84			
	14.9	14.9	14.9
88			
	14.8	14.8	14.8
90			

Subtract from table, back cover

Equation of Time (App.—Mean)

GMT h	16 m s	17 m s	18 m s
0	− 0 00.3	+ 0 14.3	+ 0 28.4
6	+ 0 03.4	+ 0 17.8	+ 0 31.9
12	+ 0 07.0	+ 0 21.4	+ 0 35.3
18	+ 0 10.7	+ 0 24.9	+ 0 38.8
24	+ 0 14.3	+ 0 28.4	+ 0 42.2

GMT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
16	23 00	13 13	4 30	15 51	0 47
17	23 42	13 14	4 28	15 48	0 43
18	24 25	13 15	4 26	15 45	0 39
19	0 25	13 16	4 23	15 42	0 35

Good Friday	16
Easter Sunday	18
First Day of Passover	18
Full Moon	18

992941°—53——5

GMT		♈ GHA	VENUS −3.3 GHA	Dec.	MARS −0.4 GHA	Dec.	JUPITER −1.6 GHA	Dec.	SATURN 0.4 GHA	Dec.	MOON GHA	code	Dec.	code
	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
19	0	206 33.6	161 09.8	+17 08.3	294 08.2	−23 51.6	124 06.8	+23 06.2	351 21.3	−11 10.7	353 51.7	138	−18 13.1	- 91
	1	221 36.1	176 09.2	09.3	309 09.8	51.7	139 08.8	06.2	6 23.9	10.7	8 24.5	137	18 22.2	- 91
	2	236 38.5	191 08.6	10.2	324 11.3	51.8	154 10.7	06.3	21 26.6	10.6	22 57.2	137	18 31.3	- 90
	3	251 41.0	206 08.0	·· 11.2	339 12.9	·· 51.9	169 12.7	·· 06.3	36 29.2	·· 10.5	37 29.9	136	·18 40.3	- 89
	4	266 43.5	221 07.5	12.2	354 14.5	51.9	184 14.7	06.3	51 31.8	10.5	52 02.5	135	18 49.2	- 89
	5	281 45.9	236 06.9	13.1	9 16.0	52.0	199 16.7	06.3	66 34.5	10.4	66 35.0	135	18 58.1	- 87
	6	296 48.4	251 06.3	+17 14.1	24 17.6	−23 52.1	214 18.7	+23 06.4	81 37.1	−11 10.4	81 07.5	134	−19 06.8	- 87
	7	311 50.9	266 05.7	15.0	39 19.1	52.2	229 20.7	06.4	96 39.8	10.3	95 39.9	134	19 15.5	- 86
	8	326 53.3	281 05.1	16.0	54 20.7	52.2	244 22.7	06.4	111 42.4	10.2	110 12.3	133	19 24.1	- 85
	9	341 55.8	296 04.5	·· 16.9	69 22.3	·· 52.3	259 24.7	·· 06.5	126 45.1	·· 10.2	124 44.6	132	·19 32.6	- 84
	10	356 58.2	311 03.9	17.9	84 23.8	52.4	274 26.7	06.5	141 47.7	10.1	139 16.8	132	19 41.0	- 84
	11	12 00.7	326 03.3	18.9	99 25.4	52.5	289 28.6	06.5	156 50.3	10.0	153 49.0	132	19 49.4	- 83
	12	27 03.2	341 02.7	+17 19.8	114 27.0	−23 52.5	304 30.6	+23 06.5	171 53.0	−11 10.0	168 21.2	130	−19 57.7	- 81
	13	42 05.6	356 02.1	20.8	129 28.5	52.6	319 32.6	06.6	186 55.6	09.9	182 53.2	131	20 05.8	- 81
	14	57 08.1	11 01.5	21.7	144 30.1	52.7	334 34.6	06.6	201 58.3	09.9	197 25.3	129	20 13.9	- 81
	15	72 10.6	26 01.0	·· 22.7	159 31.7	·· 52.8	349 36.6	·· 06.6	217 00.9	·· 09.8	211 57.2	129	·20 22.0	- 79
	16	87 13.0	41 00.4	23.6	174 33.2	52.8	4 38.6	06.7	232 03.6	09.7	226 29.1	129	20 29.9	- 78
	17	102 15.5	55 59.8	24.6	189 34.8	52.9	19 40.6	06.7	247 06.2	09.7	241 01.0	127	20 37.7	- 78
	18	117 18.0	70 59.2	+17 25.5	204 36.4	−23 53.0	34 42.6	+23 06.7	262 08.9	−11 09.6	255 32.7	128	−20 45.5	- 76
	19	132 20.4	85 58.6	26.5	219 37.9	53.1	49 44.5	06.7	277 11.5	09.6	270 04.5	126	20 53.1	- 76
	20	147 22.9	100 58.0	27.4	234 39.5	53.2	64 46.5	06.8	292 14.1	09.5	284 36.1	126	21 00.7	- 75
	21	162 25.4	115 57.4	·· 28.3	249 41.1	·· 53.2	79 48.5	·· 06.8	307 16.8	·· 09.4	299 07.7	126	·21 08.2	- 73
	22	177 27.8	130 56.8	29.3	264 42.6	53.3	94 50.5	06.8	322 19.4	09.4	313 39.3	125	21 15.5	- 73
	23	192 30.3	145 56.2	30.2	279 44.2	53.4	109 52.5	06.9	337 22.1	09.3	328 10.8	124	21 22.8	- 72
20	0	207 32.7	160 55.6	+17 31.2	294 45.8	−23 53.5	124 54.5	+23 06.9	352 24.7	−11 09.2	342 42.2	124	−21 30.0	- 71
	1	222 35.2	175 55.0	32.1	309 47.4	53.5	139 56.5	06.9	7 27.4	09.2	357 13.6	123	21 37.1	- 70
	2	237 37.7	190 54.4	33.1	324 48.9	53.6	154 58.4	06.9	22 30.0	09.1	11 44.9	122	21 44.1	- 69
	3	252 40.1	205 53.8	·· 34.0	339 50.5	·· 53.7	170 00.4	·· 07.0	37 32.7	·· 09.1	26 16.1	122	·21 51.0	- 68
	4	267 42.6	220 53.2	34.9	354 52.1	53.8	185 02.4	07.0	52 35.3	09.0	40 47.3	122	21 57.8	- 68
	5	282 45.1	235 52.6	35.9	9 53.7	53.8	200 04.4	07.0	67 37.9	08.9	55 18.5	120	22 04.6	- 66
	6	297 47.5	250 52.0	+17 36.8	24 55.3	−23 53.9	215 06.4	+23 07.0	82 40.6	−11 08.9	69 49.5	121	−22 11.2	- 65
	7	312 50.0	265 51.4	37.8	39 56.8	54.0	230 08.4	07.1	97 43.2	08.8	84 20.6	119	22 17.7	- 64
	8	327 52.5	280 50.8	38.7	54 58.4	54.1	245 10.4	07.1	112 45.9	08.7	98 51.5	119	22 24.1	- 63
	9	342 54.9	295 50.2	·· 39.6	70 00.0	·· 54.1	260 12.3	·· 07.1	127 48.5	·· 08.7	113 22.4	119	·22 30.4	- 63
	10	357 57.4	310 49.6	40.6	85 01.6	54.2	275 14.3	07.2	142 51.2	08.6	127 53.3	118	22 36.7	- 61
	11	12 59.8	325 49.0	41.5	100 03.2	54.3	290 16.3	07.2	157 53.8	08.6	142 24.1	117	22 42.8	- 60
	12	28 02.3	340 48.4	+17 42.4	115 04.7	−23 54.4	305 18.3	+23 07.2	172 56.5	−11 08.5	156 54.8	117	−22 48.8	- 59
	13	43 04.8	355 47.8	43.4	130 06.3	54.4	320 20.3	07.2	187 59.1	08.4	171 25.5	116	22 54.7	- 58
	14	58 07.2	10 47.2	44.3	145 07.9	54.5	335 22.3	07.3	203 01.7	08.4	185 56.1	116	23 00.5	- 57
	15	73 09.7	25 46.6	·· 45.2	160 09.5	·· 54.6	350 24.2	·· 07.3	218 04.4	·· 08.3	200 26.7	115	·23 06.2	- 56
	16	88 12.2	40 46.0	46.2	175 11.1	54.7	5 26.2	07.3	233 07.0	08.3	214 57.2	114	23 11.8	- 55
	17	103 14.6	55 45.4	47.1	190 12.7	54.7	20 28.2	07.3	248 09.7	08.2	229 27.6	115	23 17.3	- 54
	18	118 17.1	70 44.8	+17 48.0	205 14.2	−23 54.8	35 30.2	+23 07.4	263 12.3	−11 08.1	243 58.1	113	−23 22.7	- 52
	19	133 19.6	85 44.2	49.0	220 15.8	54.9	50 32.2	07.4	278 15.0	08.1	258 28.4	113	23 27.9	- 52
	20	148 22.0	100 43.5	49.9	235 17.4	55.0	65 34.1	07.4	293 17.6	08.0	272 58.7	112	23 33.1	- 51
	21	163 24.5	115 42.9	·· 50.8	250 19.0	·· 55.1	80 36.1	·· 07.5	308 20.3	·· 07.9	287 28.9	112	·23 38.2	- 49
	22	178 27.0	130 42.3	51.7	265 20.6	55.1	95 38.1	07.5	323 22.9	07.9	301 59.1	112	23 43.1	- 48
	23	193 29.4	145 41.7	52.7	280 22.2	55.2	110 40.1	07.5	338 25.6	07.8	316 29.3	111	23 47.9	- 48
21	0	208 31.9	160 41.1	+17 53.6	295 23.8	−23 55.3	125 42.1	+23 07.5	353 28.2	−11 07.8	330 59.4	110	−23 52.7	- 46
	1	223 34.3	175 40.5	54.5	310 25.4	55.4	140 44.1	07.6	8 30.8	07.7	345 29.4	110	23 57.3	- 45
	2	238 36.8	190 39.9	55.4	325 27.0	55.4	155 46.0	07.6	23 33.5	07.6	359 59.4	109	24 01.8	- 44
	3	253 39.3	205 39.3	·· 56.3	340 28.6	·· 55.5	170 48.0	·· 07.6	38 36.1	·· 07.6	14 29.3	109	·24 06.2	- 42
	4	268 41.7	220 38.7	57.3	355 30.2	55.6	185 50.0	07.6	53 38.8	07.5	28 59.2	109	24 10.4	- 42
	5	283 44.2	235 38.1	58.2	10 31.8	55.7	200 52.0	07.7	68 41.4	07.4	43 29.1	108	24 14.6	- 40
	6	298 46.7	250 37.4	+17 59.1	25 33.4	−23 55.7	215 54.0	+23 07.7	83 44.1	−11 07.4	57 58.9	107	−24 18.6	- 40
	7	313 49.1	265 36.8	18 00.0	40 35.0	55.8	230 55.9	07.7	98 46.7	07.3	72 28.6	107	24 22.6	- 38
	8	328 51.6	280 36.2	00.9	55 36.6	55.9	245 57.9	07.8	113 49.4	07.3	86 58.3	106	24 26.4	- 37
	9	343 54.1	295 35.6	·· 01.9	70 38.2	·· 56.0	260 59.9	·· 07.8	128 52.0	·· 07.2	101 27.9	107	·24 30.1	- 36
	10	358 56.5	310 35.0	02.8	85 39.7	56.0	276 01.9	07.8	143 54.6	07.1	115 57.6	105	24 33.7	- 34
	11	13 59.0	325 34.4	03.7	100 41.4	56.1	291 03.9	07.8	158 57.3	07.1	130 27.1	105	24 37.1	- 34
	12	29 01.5	340 33.8	+18 04.6	115 43.0	−23 56.2	306 05.8	+23 07.9	173 59.9	−11 07.0	144 56.6	105	−24 40.5	- 32
	13	44 03.9	355 33.2	05.5	130 44.6	56.3	321 07.8	07.9	189 02.6	06.9	159 26.1	104	24 43.7	- 31
	14	59 06.4	10 32.5	06.4	145 46.2	56.3	336 09.8	07.9	204 05.2	06.9	173 55.5	104	24 46.8	- 30
	15	74 08.8	25 31.9	·· 07.3	160 47.8	·· 56.4	351 11.8	·· 07.9	219 07.9	·· 06.8	188 24.9	104	·24 49.8	- 29
	16	89 11.3	40 31.3	08.3	175 49.4	56.5	6 13.8	08.0	234 10.5	06.8	202 54.3	103	24 52.7	- 27
	17	104 13.8	55 30.7	09.2	190 51.0	56.6	21 15.7	08.0	249 13.2	06.7	217 23.6	102	24 55.4	- 26
	18	119 16.2	70 30.1	+18 10.1	205 52.6	−23 56.7	36 17.7	+23 08.0	264 15.8	−11 06.6	231 52.8	103	−24 58.0	- 25
	19	134 18.7	85 29.5	11.0	220 54.2	56.7	51 19.7	08.1	279 18.5	06.6	246 22.1	102	25 00.5	- 24
	20	149 21.2	100 28.8	11.9	235 55.8	56.8	66 21.7	08.1	294 21.1	06.5	260 51.3	101	25 02.9	- 23
	21	164 23.6	115 28.2	·· 12.8	250 57.4	·· 56.9	81 23.6	·· 08.1	309 23.8	·· 06.5	275 20.4	101	·25 05.2	- 21
	22	179 26.1	130 27.6	13.7	265 59.0	57.0	96 25.6	08.1	324 26.4	06.4	289 49.5	101	25 07.3	- 20
	23	194 28.6	145 27.0	14.6	281 00.6	57.0	111 27.6	08.2	339 29.0	06.3	304 18.6	101	25 09.3	- 19
	24	209 31.0	160 26.4	+18 15.5	296 02.2	−23 57.1	126 29.6	+23 08.2	354 31.7	−11 06.3	318 47.7	100	−25 11.2	- 17
code		—	− 6	+ 10	+ 16	0	+ 20	0	+ 26	+ 1				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
19 0	180 10.6	+10 54.5
1	195 10.8	55.4
2	210 10.9	56.3
3	225 11.0	•• 57.1
4	240 11.2	58.0
5	255 11.3	58.9
6	270 11.5	+10 59.7
7	285 11.6	11 00.6
8	300 11.7	01.5
9	315 11.9	•• 02.3
10	330 12.0	03.2
11	345 12.2	04.1
12	0 12.3	+11 04.9
13	15 12.4	05.8
14	30 12.6	06.7
15	45 12.7	•• 07.5
16	60 12.9	08.4
17	75 13.0	09.3
18	90 13.1	+11 10.1
19	105 13.3	11.0
20	120 13.4	11.9
21	135 13.5	•• 12.7
22	150 13.7	13.6
23	165 13.8	14.5
20 0	180 14.0	+11 15.3
1	195 14.1	16.2
2	210 14.2	17.0
3	225 14.4	•• 17.9
4	240 14.5	18.8
5	255 14.6	19.6
6	270 14.8	+11 20.5
7	285 14.9	21.3
8	300 15.0	22.2
9	315 15.2	•• 23.1
10	330 15.3	23.9
11	345 15.4	24.8
12	0 15.6	+11 25.6
13	15 15.7	26.5
14	30 15.9	27.4
15	45 16.0	•• 28.2
16	60 16.1	29.1
17	75 16.3	29.9
18	90 16.4	+11 30.8
19	105 16.5	31.6
20	120 16.7	32.5
21	135 16.8	•• 33.4
22	150 16.9	34.2
23	165 17.1	35.1
21 0	180 17.2	+11 35.9
1	195 17.3	36.8
2	210 17.4	37.6
3	225 17.6	•• 38.5
4	240 17.7	39.3
5	255 17.8	40.2
6	270 18.0	+11 41.1
7	285 18.1	41.9
8	300 18.2	42.8
9	315 18.4	•• 43.6
10	330 18.5	44.5
11	345 18.6	45.3
12	0 18.8	+11 46.2
13	15 18.9	47.0
14	30 19.0	47.9
15	45 19.1	•• 48.7
16	60 19.3	49.6
17	75 19.4	50.4
18	90 19.5	+11 51.3
19	105 19.7	52.1
20	120 19.8	53.0
21	135 19.9	•• 53.8
22	150 20.1	54.7
23	165 20.2	55.5
24	180 20.3	+11 56.3
code	—	+ 9

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 52.3	−40 29.2
5	Achernar	336 00.1	−57 28.0
30	Acrux	173 58.6	−62 51.1
19	Adhara	255 47.5	−28 54.7
10	Aldebaran	291 40.6	+16 25.2
32	Alioth	166 58.8	+56 12.4
34	Alkaid	153 33.2	+49 32.3
55	Al Na'ir	28 39.5	−47 10.8
15	Alnilam	276 31.6	− 1 13.8
25	Alphard	218 39.6	− 8 27.8
41	Alphecca	126 48.2	+26 51.8
1	Alpheratz	358 29.8	+28 50.2
51	Altair	62 51.5	+ 8 44.6
2	Ankaa	353 59.7	−42 33.1
42	Antares	113 20.4	−26 20.1
37	Arcturus	146 35.8	+19 25.0
43	Atria	109 01.8	−68 56.7
22	Avior	234 36.3	−59 22.1
13	Bellatrix	279 19.8	+ 6 18.6
16	Betelg'se	271 49.5	+ 7 24.0
17	Canopus	264 16.1	−52 40.4
12	Capella	281 40.4	+45 57.4
53	Deneb	50 01.9	+45 06.7
28	Denebola	183 18.5	+14 49.5
4	Diphda	349 40.6	−18 14.2
27	Dubhe	194 45.3	+62 00.0
14	Elnath	279 09.0	+28 34.3
47	Eltanin	91 06.5	+51 29.3
54	Enif	34 30.8	+ 9 39.8
56	Fomalhaut	16 13.0	−29 51.8
31	Gacrux	172 50.0	−56 51.7
29	Gienah	176 37.7	−17 17.6
35	Hadar	149 50.4	−60 09.4
6	Hamal	328 51.2	+23 14.8
48	Kaus Aust.	84 42.4	−34 24.5
40	Kochab	137 16.5	+74 20.3
57	Markab	14 22.8	+14 57.5
8	Menkar	315 01.8	+ 3 54.7
36	Menkent	148 59.6	−36 09.0
24	Miapl'dus	221 49.2	−69 32.1
9	Mirfak	309 44.5	+49 42.1
50	Nunki	76 53.1	−26 21.3
52	Peacock	54 29.0	−56 52.8
21	Pollux	244 21.9	+28 08.3
20	Procyon	245 46.2	+ 5 20.5
46	R'alhague	96 47.4	+12 35.3
26	Regulus	208 30.5	+12 11.4
11	Rigel	281 54.9	− 8 15.3
38	Rigil Kent.	140 51.9	−60 39.1
44	Sabik	103 03.2	−15 40.3
3	Schedar	350 31.9	+56 17.2
45	Shaula	97 21.9	−37 04.4
18	Sirius	259 12.9	−16 39.3
33	Spica	159 17.7	−10 55.6
23	Suhail	223 25.1	−43 15.2
49	Vega	81 08.8	+38 44.1
39	Zub'g'bi	137 54.3	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 19	Moonrise 20	Moonrise 21	Moonrise 22
N °	h m	h m	h m	h m	h m	h m
72	3 12	////	■	■	■	■
70	3 33	////	■	■	■	■
68	3 49	////	24 27	0 27	■	■
66	4 02	////	23 17	■	■	■
64	4 13	////	22 41	24 20	0 20	1 53
62	4 22	////	22 16	23 42	24 58	0 58
60	4 30	0 52	21 56	23 15	24 25	0 25
58	4 37	1 37	21 39	22 54	24 02	0 02
56	4 43	2 04	21 26	22 37	23 42	24 35
54	4 49	2 24	21 14	22 23	23 26	24 19
52	4 54	2 40	21 03	22 10	23 12	24 05
50	4 58	2 54	20 54	21 59	23 00	23 53
45	5 08	3 19	20 34	21 36	22 35	23 28
40	5 16	3 39	20 18	21 18	22 15	23 07
35	5 23	3 54	20 05	21 02	21 58	22 50
30	5 28	4 05	19 53	20 49	21 43	22 36
20	5 39	4 23	19 33	20 26	21 19	22 11
10	5 47	4 36	19 16	20 06	20 58	21 50
0	5 56	4 46	19 00	19 48	20 38	21 30
10	6 04	4 53	18 44	19 30	20 19	21 10
20	6 12	4 58	18 27	19 11	19 58	20 49
30	6 22	5 01	18 08	18 48	19 34	20 24
35	6 27	5 02	17 57	18 35	19 19	20 10
40	6 33	5 02	17 44	18 20	19 03	19 53
45	6 40	5 01	17 29	18 02	18 43	19 33
50	6 49	5 00	17 10	17 40	18 19	19 08
52	6 53	4 58	17 01	17 30	18 07	18 56
54	6 57	4 58	16 52	17 18	17 54	18 42
56	7 02	4 56	16 41	17 05	17 38	18 26
58	7 07	4 54	16 28	16 49	17 20	18 06
60 S	7 13	4 51	16 14	16 30	16 57	17 42

Lat.	Sunset	Twlt. ends	Moonset 19	Moonset 20	Moonset 21	Moonset 22
N °	h m	h m	h m	h m	h m	h m
72	20 50	////	■	■	■	■
70	20 28	////	1 57	■	■	■
68	20 12	////	2 41	1 45	■	■
66	19 58	////	3 11	2 56	■	■
64	19 47	////	3 33	3 32	3 34	3 46
62	19 37	////	3 51	3 58	4 12	4 42
60	19 29	23 23	4 06	4 19	4 39	5 14
58	19 22	22 29	4 19	4 36	5 01	5 38
56	19 16	22 00	4 30	4 50	5 18	5 58
54	19 10	21 39	4 40	5 02	5 33	6 14
52	19 05	21 22	4 48	5 13	5 46	6 28
50	19 01	21 08	4 56	5 23	5 57	6 41
45	18 51	20 41	5 13	5 43	6 21	7 06
40	18 43	20 22	5 27	6 00	6 40	7 26
35	18 36	20 06	5 38	6 14	6 55	7 43
30	18 30	19 54	5 49	6 27	7 09	7 57
20	18 20	19 36	6 06	6 48	7 33	8 22
10	18 11	19 23	6 22	7 06	7 53	8 43
0	18 02	19 12	6 36	7 23	8 12	9 03
10	17 54	19 05	6 51	7 40	8 31	9 23
20	17 46	19 00	7 06	7 59	8 52	9 44
30	17 36	18 56	7 24	8 20	9 15	10 09
35	17 30	18 55	7 35	8 32	9 29	10 24
40	17 24	18 55	7 47	8 47	9 45	10 40
45	17 17	18 55	8 01	9 04	10 04	11 00
50	17 08	18 56	8 19	9 25	10 29	11 26
52	17 04	18 57	8 27	9 35	10 40	11 38
54	17 00	18 58	8 36	9 47	10 53	11 52
56	16 55	19 00	8 47	10 00	11 09	12 08
58	16 50	19 02	8 59	10 15	11 27	12 27
60 S	16 44	19 04	9 12	10 34	11 49	12 52

GMT	Equation of Time (App.—Mean) 19	20	21
h	m s	m s	m s
0	+ 0 42.2	+ 0 55.5	+ 1 08.5
6	+ 0 45.6	+ 0 58.8	+ 1 11.6
12	+ 0 48.9	+ 1 02.1	+ 1 14.8
18	+ 0 52.2	+ 1 05.3	+ 1 17.9
24	+ 0 55.5	+ 1 08.5	+ 1 21.0

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
19	0 25	13 16	4 23	15 42	0 35
20	1 12	13 17	4 21	15 38	0 30
21	2 00	13 18	4 18	15 35	0 26
22	2 51	13 19	4 15	15 32	0 22

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.3	0.1	0.2
30			
	0.3	0.1	0.1
45			
	0.3	0.1	0.1
60			
	0.3	0.0	0.1
75			
	0.3	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	19	20	21
°	′	′	′
0			
	11.9	12.1	12.5
4			
	11.9	12.1	12.5
8			
	11.9	12.2	12.5
12			
	11.9	12.2	12.6
16			
	12.0	12.2	12.6
20			
	12.1	12.3	12.7
24			
	12.2	12.4	12.7
28			
	12.2	12.5	12.8
32			
	12.4	12.6	12.9
36			
	12.5	12.7	13.0
40			
	12.6	12.8	13.1
44			
	12.7	12.9	13.2
48			
	12.9	13.1	13.4
52			
	13.1	13.2	13.5
56			
	13.2	13.4	13.6
60			
	13.4	13.5	13.8
64			
	13.6	13.7	13.9
68			
	13.8	13.9	14.1
72			
	14.0	14.1	14.2
76			
	14.2	14.3	14.4
80			
	14.4	14.4	14.6
84			
	14.6	14.6	14.7
88			
	14.7	14.8	14.9
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	19	20	21
°	′	′	′
0			
	17.7	17.5	17.3
4			
	17.6	17.5	17.3
8			
	17.6	17.5	17.3
12			
	17.6	17.4	17.2
16			
	17.5	17.4	17.2
20			
	17.5	17.3	17.1
24			
	17.4	17.2	17.1
28			
	17.3	17.2	17.0
32			
	17.2	17.1	16.9
36			
	17.0	16.9	16.8
40			
	16.9	16.8	16.7
44			
	16.8	16.7	16.6
48			
	16.6	16.6	16.4
52			
	16.5	16.4	16.3
56			
	16.3	16.2	16.2
60			
	16.1	16.1	16.0
64			
	15.9	15.9	15.9
68			
	15.8	15.7	15.7
72			
	15.6	15.6	15.6
76			
	15.4	15.4	15.4
80			
	15.2	15.2	15.2
84			
	15.0	15.0	15.1
88			
	14.8	14.9	14.9
90			

Subtract from table, back cover

GMT		♈ GHA	VENUS −3.3 GHA	VENUS Dec.	MARS −0.4 GHA	MARS Dec.	JUPITER −1.6 GHA	JUPITER Dec.	SATURN 0.4 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
22	0	209 31.0	160 26.4	+18 15.5	296 02.2	−23 57.1	126 29.6	+23 08.2	354 31.7	−11 06.3	318 47.7	100	−25 11.2	−17
	1	224 33.5	175 25.7	16.4	311 03.8	57.2	141 31.6	08.2	9 34.3	06.2	333 16.7	99	25 12.9	−17
	2	239 35.9	190 25.1	17.3	326 05.4	57.3	156 33.5	08.2	24 37.0	06.1	347 45.6	100	25 14.6	−15
	3	254 38.4	205 24.5	·· 18.2	341 07.1	·· 57.3	171 35.5	·· 08.3	39 39.6	·· 06.1	2 14.6	99	·25 16.1	−14
	4	269 40.9	220 23.9	19.1	356 08.7	57.4	186 37.5	08.3	54 42.3	06.0	16 43.5	99	25 17.5	−12
	5	284 43.3	235 23.3	20.0	11 10.3	57.5	201 39.5	08.3	69 44.9	06.0	31 12.4	98	25 18.7	−12
	6	299 45.8	250 22.6	+18 20.9	26 11.9	−23 57.6	216 41.4	+23 08.3	84 47.6	−11 05.9	45 41.2	99	−25 19.9	−10
	7	314 48.3	265 22.0	21.8	41 13.5	57.6	231 43.4	08.4	99 50.2	05.8	60 10.1	98	25 20.9	−8
	8	329 50.7	280 21.4	22.7	56 15.1	57.7	246 45.4	08.4	114 52.9	05.8	74 38.9	97	25 21.7	−8
	9	344 53.2	295 20.8	·· 23.6	71 16.8	·· 57.8	261 47.4	·· 08.4	129 55.5	·· 05.7	89 07.6	98	·25 22.5	−6
	10	359 55.7	310 20.1	24.5	86 18.4	57.9	276 49.3	08.5	144 58.1	05.6	103 36.4	97	25 23.1	−5
	11	14 58.1	325 19.5	25.4	101 20.0	58.0	291 51.3	08.5	160 00.8	05.6	118 05.1	97	25 23.6	−4
	12	30 00.6	340 18.9	+18 26.3	116 21.6	−23 58.0	306 53.3	+23 08.5	175 03.4	−11 05.5	132 33.8	97	−25 24.0	−2
	13	45 03.1	355 18.3	27.2	131 23.2	58.1	321 55.3	08.5	190 06.1	05.5	147 02.5	96	25 24.2	−1
	14	60 05.5	10 17.6	28.1	146 24.9	58.2	336 57.2	08.6	205 08.7	05.4	161 31.1	97	25 24.3	0
	15	75 08.0	25 17.0	·· 29.0	161 26.5	·· 58.3	351 59.2	·· 08.6	220 11.4	·· 05.3	175 59.8	96	·25 24.3	+2
	16	90 10.4	40 16.4	29.9	176 28.1	58.3	7 01.2	08.6	235 14.0	05.3	190 28.4	96	25 24.1	+2
	17	105 12.9	55 15.8	30.8	191 29.7	58.4	22 03.2	08.6	250 16.7	05.2	204 57.0	95	25 23.9	+5
	18	120 15.4	70 15.1	+18 31.7	206 31.3	−23 58.5	37 05.1	+23 08.7	265 19.3	−11 05.1	219 25.5	96	−25 23.4	+5
	19	135 17.8	85 14.5	32.6	221 33.0	58.6	52 07.1	08.7	280 22.0	05.1	233 54.1	95	25 22.9	+7
	20	150 20.3	100 13.9	33.4	236 34.6	58.6	67 09.1	08.7	295 24.6	05.0	248 22.6	96	25 22.2	+8
	21	165 22.8	115 13.2	·· 34.3	251 36.2	·· 58.7	82 11.1	·· 08.7	310 27.3	·· 05.0	262 51.2	95	·25 21.4	+9
	22	180 25.2	130 12.6	35.2	266 37.9	58.8	97 13.0	08.8	325 29.9	04.9	277 19.7	95	25 20.5	+11
	23	195 27.7	145 12.0	36.1	281 39.5	58.9	112 15.0	08.8	340 32.5	04.8	291 48.2	95	25 19.4	+12
23	0	210 30.2	160 11.3	+18 37.0	296 41.1	−23 59.0	127 17.0	+23 08.8	355 35.2	−11 04.8	306 16.7	94	−25 18.2	+13
	1	225 32.6	175 10.7	37.9	311 42.7	59.0	142 19.0	08.9	10 37.8	04.7	320 45.1	95	25 16.9	+14
	2	240 35.1	190 10.1	38.8	326 44.4	59.1	157 20.9	08.9	25 40.5	04.7	335 13.6	95	25 15.5	+16
	3	255 37.6	205 09.4	·· 39.6	341 46.0	·· 59.2	172 22.9	·· 08.9	40 43.1	·· 04.6	349 42.1	94	·25 13.9	+17
	4	270 40.0	220 08.8	40.5	356 47.6	59.3	187 24.9	08.9	55 45.8	04.5	4 10.5	94	25 12.2	+19
	5	285 42.5	235 08.2	41.4	11 49.3	59.3	202 26.8	09.0	70 48.4	04.5	18 38.9	95	25 10.3	+20
	6	300 44.9	250 07.5	+18 42.3	26 50.9	−23 59.4	217 28.8	+23 09.0	85 51.1	−11 04.4	33 07.4	94	−25 08.3	+21
	7	315 47.4	265 06.9	43.2	41 52.5	59.5	232 30.8	09.0	100 53.7	04.3	47 35.8	94	25 06.2	+22
	8	330 49.9	280 06.3	44.0	56 54.2	59.6	247 32.8	09.0	115 56.4	04.3	62 04.2	94	25 04.0	+24
	9	345 52.3	295 05.6	·· 44.9	71 55.8	·· 59.6	262 34.7	·· 09.1	130 59.0	·· 04.2	76 32.6	95	·25 01.6	+25
	10	0 54.8	310 05.0	45.8	86 57.5	59.7	277 36.7	09.1	146 01.7	04.2	91 01.1	94	24 59.1	+27
	11	15 57.3	325 04.4	46.7	101 59.1	59.8	292 38.7	09.1	161 04.3	04.1	105 29.5	94	24 56.4	+27
	12	30 59.7	340 03.7	+18 47.5	117 00.7	−23 59.9	307 40.6	+23 09.1	176 06.9	−11 04.0	119 57.9	94	−24 53.7	+29
	13	46 02.2	355 03.1	48.4	132 02.4	24 00.0	322 42.6	09.2	191 09.6	04.0	134 26.3	94	24 50.8	+31
	14	61 04.7	10 02.5	49.3	147 04.0	00.0	337 44.6	09.2	206 12.2	03.9	148 54.7	94	24 47.7	+31
	15	76 07.1	25 01.8	·· 50.2	162 05.7	·· 00.1	352 46.6	·· 09.2	221 14.9	·· 03.8	163 23.1	94	·24 44.6	+33
	16	91 09.6	40 01.2	51.0	177 07.3	00.2	7 48.5	09.2	236 17.5	03.8	177 51.5	95	24 41.3	+34
	17	106 12.1	55 00.5	51.9	192 08.9	00.3	22 50.5	09.3	251 20.2	03.7	192 20.0	94	24 37.9	+36
	18	121 14.5	69 59.9	+18 52.8	207 10.6	−24 00.3	37 52.5	+23 09.3	266 22.8	−11 03.7	206 48.4	94	−24 34.3	+37
	19	136 17.0	84 59.3	53.6	222 12.2	00.4	52 54.4	09.3	281 25.5	03.6	221 16.8	95	24 30.6	+38
	20	151 19.4	99 58.6	54.5	237 13.9	00.5	67 56.4	09.3	296 28.1	03.5	235 45.3	94	24 26.8	+39
	21	166 21.9	114 58.0	·· 55.4	252 15.5	·· 00.6	82 58.4	·· 09.4	311 30.8	·· 03.5	250 13.7	94	·24 22.9	+41
	22	181 24.4	129 57.3	56.2	267 17.2	00.7	98 00.3	09.4	326 33.4	03.4	264 42.1	95	24 18.8	+42
	23	196 26.8	144 56.7	57.1	282 18.8	00.7	113 02.3	09.4	341 36.1	03.3	279 10.6	95	24 14.6	+44
24	0	211 29.3	159 56.0	+18 58.0	297 20.5	−24 00.8	128 04.3	+23 09.5	356 38.7	−11 03.3	293 39.1	94	−24 10.2	+44
	1	226 31.8	174 55.4	58.8	312 22.1	00.9	143 06.3	09.5	11 41.4	03.2	308 07.5	95	24 05.8	+46
	2	241 34.2	189 54.8	18 59.7	327 23.8	01.0	158 08.2	09.5	26 44.0	03.2	322 36.0	95	24 01.2	+47
	3	256 36.7	204 54.1	·19 00.6	342 25.4	·· 01.0	173 10.2	·· 09.5	41 46.6	·· 03.1	337 04.5	95	·23 56.5	+49
	4	271 39.2	219 53.5	01.4	357 27.1	01.1	188 12.2	09.6	56 49.3	03.0	351 33.0	96	23 51.6	+50
	5	286 41.6	234 52.8	02.3	12 28.7	01.2	203 14.1	09.6	71 51.9	03.0	6 01.6	95	23 46.6	+51
	6	301 44.1	249 52.2	+19 03.1	27 30.4	−24 01.3	218 16.1	+23 09.6	86 54.6	−11 02.9	20 30.1	96	−23 41.5	+52
	7	316 46.5	264 51.5	04.0	42 32.0	01.3	233 18.1	09.6	101 57.2	02.9	34 58.7	95	23 36.3	+54
	8	331 49.0	279 50.9	04.9	57 33.7	01.4	248 20.0	09.7	116 59.9	02.8	49 27.2	96	23 30.9	+55
	9	346 51.5	294 50.2	·· 05.7	72 35.3	·· 01.5	263 22.0	·· 09.7	132 02.5	·· 02.7	63 55.8	96	·23 25.4	+56
	10	1 53.9	309 49.6	06.6	87 37.0	01.6	278 24.0	09.7	147 05.2	02.7	78 24.4	96	23 19.8	+57
	11	16 56.4	324 48.9	07.4	102 38.7	01.7	293 25.9	09.7	162 07.8	02.6	92 53.0	96	23 14.1	+59
	12	31 58.9	339 48.3	+19 08.3	117 40.3	−24 01.7	308 27.9	+23 09.8	177 10.5	−11 02.5	107 21.6	97	−23 08.2	+60
	13	47 01.3	354 47.6	09.1	132 42.0	01.8	323 29.9	09.8	192 13.1	02.5	121 50.3	97	23 02.2	+61
	14	62 03.8	9 47.0	10.0	147 43.6	01.9	338 31.8	09.8	207 15.8	02.4	136 19.0	96	22 56.1	+63
	15	77 06.3	24 46.4	·· 10.8	162 45.3	·· 02.0	353 33.8	·· 09.8	222 18.4	·· 02.4	150 47.6	97	·22 49.8	+64
	16	92 08.7	39 45.7	11.7	177 47.0	02.0	8 35.8	09.9	237 21.1	02.3	165 16.3	98	22 43.4	+65
	17	107 11.2	54 45.0	12.5	192 48.6	02.1	23 37.7	09.9	252 23.7	02.2	179 45.1	97	22 36.9	+66
	18	122 13.7	69 44.4	+19 13.4	207 50.3	−24 02.2	38 39.7	+23 09.9	267 26.3	−11 02.2	194 13.8	98	−22 30.3	+67
	19	137 16.1	84 43.7	14.2	222 52.0	02.3	53 41.7	09.9	282 29.0	02.1	208 42.6	98	22 23.6	+69
	20	152 18.6	99 43.1	15.1	237 53.6	02.4	68 43.6	10.0	297 31.6	02.0	223 11.4	98	22 16.7	+70
	21	167 21.0	114 42.4	·· 15.9	252 55.3	·· 02.4	83 45.6	·· 10.0	312 34.3	·· 02.0	237 40.2	98	·22 09.7	+71
	22	182 23.5	129 41.8	16.8	267 57.0	02.5	98 47.6	10.0	327 36.9	01.9	252 09.0	99	22 02.6	+73
	23	197 26.0	144 41.1	17.6	282 58.6	02.6	113 49.5	10.0	342 39.6	01.9	266 37.9	98	21 55.3	+73
	24	212 28.4	159 40.5	+19 18.5	298 00.3	−24 02.7	128 51.5	+23 10.1	357 42.2	−11 01.8	281 06.7	99	−21 48.0	+75
	code	—	−6	+9	+17	−1	+20	+1	+27	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
22 0	180 20.3	+11 56.3
1	195 20.4	57.2
2	210 20.6	58.0
3	225 20.7	·· 58.9
4	240 20.8	11 59.7
5	255 20.9	12 00.6
6	270 21.1	+12 01.4
7	285 21.2	02.3
8	300 21.3	03.1
9	315 21.4	·· 04.0
10	330 21.6	04.8
11	345 21.7	05.6
12	0 21.8	+12 06.5
13	15 22.0	07.3
14	30 22.1	08.2
15	45 22.2	·· 09.0
16	60 22.3	09.9
17	75 22.5	10.7
18	90 22.6	+12 11.5
19	105 22.7	12.4
20	120 22.8	13.2
21	135 22.9	·· 14.1
22	150 23.1	14.9
23	165 23.2	15.7
23 0	180 23.3	+12 16.6
1	195 23.4	17.4
2	210 23.6	18.2
3	225 23.7	·· 19.1
4	240 23.8	19.9
5	255 23.9	20.8
6	270 24.1	+12 21.6
7	285 24.2	22.4
8	300 24.3	23.3
9	315 24.4	·· 24.1
10	330 24.5	24.9
11	345 24.7	25.8
12	0 24.8	+12 26.6
13	15 24.9	27.4
14	30 25.0	28.3
15	45 25.1	·· 29.1
16	60 25.3	29.9
17	75 25.4	30.8
18	90 25.5	+12 31.6
19	105 25.6	32.4
20	120 25.7	33.3
21	135 25.9	·· 34.1
22	150 26.0	34.9
23	165 26.1	35.8
24 0	180 26.2	+12 36.6
1	195 26.3	37.4
2	210 26.5	38.3
3	225 26.6	·· 39.1
4	240 26.7	39.9
5	255 26.8	40.7
6	270 26.9	+12 41.6
7	285 27.0	42.4
8	300 27.2	43.2
9	315 27.3	·· 44.1
10	330 27.4	44.9
11	345 27.5	45.7
12	0 27.6	+12 46.5
13	15 27.7	47.4
14	30 27.8	48.2
15	45 28.0	·· 49.0
16	60 28.1	49.8
17	75 28.2	50.7
18	90 28.3	+12 51.5
19	105 28.4	52.3
20	120 28.5	53.1
21	135 28.7	·· 54.0
22	150 28.8	54.8
23	165 28.9	55.6
24	180 29.0	+12 56.4
code	—	+ 8

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 52.3	−40 29.2
5	Achernar	336 00.1	−57 28.0
30	Acrux	173 58.6	−62 51.1
19	Adhara	255 47.5	−28 54.7
10	Aldebaran	291 40.6	+16 25.2
32	Alioth	166 58.8	+56 12.4
34	Alkaid	153 33.2	+49 32.3
55	Al Na'ir	28 39.4	−47 10.8
15	Alnilam	276 31.6	− 1 13.8
25	Alphard	218 39.6	− 8 27.8
41	Alphecca	126 48.2	+26 51.8
1	Alpheratz	358 29.8	+28 50.2
51	Altair	62 51.4	+ 8 44.6
2	Ankaa	353 59.7	−42 33.1
42	Antares	113 20.4	−26 20.1
37	Arcturus	146 35.8	+19 25.0
43	Atria	109 01.7	−68 56.8
22	Avior	234 36.3	−59 22.1
13	Bellatrix	279 19.8	+ 6 18.6
16	Betelg'se	271 49.5	+ 7 24.0
17	Canopus	264 16.1	−52 40.4
12	Capella	281 40.4	+45 57.4
53	Deneb	50 01.8	+45 06.7
28	Denebola	183 18.5	+14 49.5
4	Diphda	349 40.6	−18 14.2
27	Dubhe	194 45.3	+62 00.0
14	Elnath	279 09.0	+28 34.3
47	Eltanin	91 06.4	+51 29.3
54	Enif	34 30.8	+ 9 39.8
56	Fomalhaut	16 13.0	−29 51.8
31	Gacrux	172 50.1	−56 51.7
29	Gienah	176 37.7	−17 17.6
35	Hadar	149 50.4	−60 09.4
6	Hamal	328 51.2	+23 14.8
48	Kaus Aust.	84 42.4	−34 24.5
40	Kochab	137 16.5	+74 20.4
57	Markab	14 22.8	+14 57.5
8	Menkar	315 01.8	+ 3 54.7
36	Menkent	148 59.6	−36 09.0
24	Miapl'dus	221 49.2	−69 32.1
9	Mirfak	309 44.5	+49 42.1
50	Nunki	76 53.1	−26 21.3
52	Peacock	54 28.9	−56 52.8
21	Pollux	244 21.9	+28 08.3
20	Procyon	245 46.2	+ 5 20.5
46	R'alhague	96 47.4	+12 35.3
26	Regulus	208 30.5	+12 11.4
11	Rigel	281 54.9	− 8 15.2
38	Rigil Kent.	140 51.9	−60 39.1
44	Sabik	103 03.2	−15 40.3
3	Schedar	350 31.9	+56 17.2
45	Shaula	97 21.9	−37 04.4
18	Sirius	259 12.9	−16 39.3
33	Spica	159 17.7	−10 55.6
23	Suhail	223 25.1	−43 15.2
49	Vega	81 08.8	+38 44.1
39	Zub'g'bi	137 54.2	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 22	Moonrise 23	Moonrise 24	Moonrise 25
N °	h m	h m	h m	h m	h m	h m
72	2 54	////	■	■	■	■
70	3 18	////	■	■	■	■
68	3 36	////	■	■	■	4 26
66	3 51	////	■	■	4 18	3 31
64	4 03	////	1 53	2 45	2 56	2 58
62	4 13	////	0 58	1 51	2 20	2 33
60	4 22	////	0 25	1 19	1 53	2 14
58	4 29	1 16	0 02	0 55	1 32	1 58
56	4 36	1 49	24 35	0 35	1 15	1 44
54	4 42	2 12	24 19	0 19	1 01	1 32
52	4 47	2 31	24 05	0 05	0 48	1 21
50	4 52	2 45	23 53	24 37	0 37	1 12
45	5 03	3 12	23 28	24 13	0 13	0 52
40	5 11	3 33	23 07	23 54	24 36	0 36
35	5 19	3 49	22 50	23 39	24 22	0 22
30	5 25	4 01	22 36	23 25	24 10	0 10
20	5 36	4 21	22 11	23 02	23 49	24 34
10	5 46	4 35	21 50	22 41	23 31	24 19
0	5 55	4 45	21 30	22 22	23 15	24 06
10	6 04	4 53	21 10	22 04	22 58	23 52
20	6 13	4 59	20 49	21 43	22 40	23 37
30	6 24	5 03	20 24	21 20	22 19	23 20
35	6 30	5 04	20 10	21 06	22 06	23 10
40	6 36	5 04	19 53	20 50	21 52	22 59
45	6 44	5 05	19 33	20 31	21 36	22 45
50	6 54	5 04	19 08	20 07	21 15	22 29
52	6 58	5 03	18 56	19 56	21 05	22 21
54	7 03	5 02	18 42	19 42	20 54	22 12
56	7 08	5 01	18 26	19 27	20 41	22 02
58	7 14	5 00	18 06	19 09	20 26	21 51
60	7 21	4 58	17 42	18 47	20 08	21 38
S						

Lat.	Sunset	Twlt. ends	Moonset 22	Moonset 23	Moonset 24	Moonset 25
N °	h m	h m	h m	h m	h m	h m
72	21 08	////	■	■	■	■
70	20 43	////	■	■	■	■
68	20 24	////	■	■	■	6 40
66	20 09	////	■	■	4 59	7 35
64	19 56	////	3 46	4 43	6 21	8 07
62	19 46	////	4 42	5 36	6 57	8 31
60	19 37	////	5 14	6 09	7 23	8 50
58	19 29	22 50	5 38	6 33	7 44	9 05
56	19 22	22 14	5 58	6 52	8 00	9 19
54	19 16	21 50	6 14	7 08	8 15	9 30
52	19 11	21 32	6 28	7 22	8 27	9 40
50	19 06	21 16	6 41	7 34	8 38	9 49
45	18 55	20 47	7 06	7 59	9 01	10 08
40	18 46	20 26	7 26	8 19	9 19	10 24
35	18 39	20 10	7 43	8 36	9 34	10 37
30	18 32	19 57	7 57	8 50	9 48	10 48
20	18 21	19 38	8 22	9 15	10 10	11 07
10	18 11	19 23	8 43	9 36	10 29	11 24
0	18 02	19 12	9 03	9 55	10 48	11 39
10	17 53	19 04	9 23	10 15	11 06	11 54
20	17 44	18 58	9 44	10 36	11 25	12 11
30	17 33	18 53	10 09	11 00	11 47	12 30
35	17 27	18 52	10 24	11 14	12 00	12 40
40	17 20	18 51	10 40	11 30	12 14	12 53
45	17 12	18 50	11 00	11 50	12 32	13 07
50	17 02	18 50	11 26	12 14	12 53	13 25
52	16 58	18 51	11 38	12 26	13 04	13 33
54	16 53	18 52	11 52	12 39	13 15	13 43
56	16 48	18 53	12 08	12 54	13 28	13 53
58	16 42	18 54	12 27	13 12	13 44	14 05
60	16 35	18 55	12 52	13 35	14 02	14 18
S						

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.2	0.1	0.2
30			
	0.2	0.1	0.2
45			
	0.2	0.1	0.1
60			
	0.2	0.0	0.1
75			
	0.2	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	22	23	24
°	′	′	′
0			
	12.9	13.6	14.4
4			
	12.9	13.7	14.4
8			
	12.9	13.7	14.4
12			
	12.9	13.7	14.4
16			
	13.0	13.7	14.4
20			
	13.0	13.8	14.5
24			
	13.1	13.8	14.5
28			
	13.2	13.8	14.5
32			
	13.2	13.9	14.6
36			
	13.3	14.0	14.6
40			
	13.4	14.0	14.6
44			
	13.5	14.1	14.7
48			
	13.6	14.2	14.7
52			
	13.7	14.3	14.8
56			
	13.9	14.3	14.8
60			
	14.0	14.4	14.9
64			
	14.1	14.5	14.9
68			
	14.3	14.6	15.0
72			
	14.4	14.7	15.1
76			
	14.5	14.8	15.1
80			
	14.7	14.9	15.2
84			
	14.8	15.0	15.2
88			
	14.9	15.1	15.3
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	22	23	24
°	′	′	′
0			
	17.1	16.6	16.2
4			
	17.1	16.6	16.2
8			
	17.0	16.6	16.2
12			
	17.0	16.6	16.2
16			
	17.0	16.6	16.2
20			
	16.9	16.5	16.1
24			
	16.9	16.5	16.1
28			
	16.8	16.4	16.1
32			
	16.7	16.4	16.1
36			
	16.6	16.3	16.0
40			
	16.5	16.3	16.0
44			
	16.4	16.2	15.9
48			
	16.3	16.1	15.9
52			
	16.2	16.0	15.8
56			
	16.1	15.9	15.8
60			
	16.0	15.8	15.7
64			
	15.8	15.8	15.7
68			
	15.7	15.7	15.6
72			
	15.6	15.6	15.6
76			
	15.4	15.5	15.5
80			
	15.3	15.4	15.4
84			
	15.1	15.2	15.4
88			
	15.0	15.2	15.3
90			

Subtract from table, back cover

Equation of Time (App.—Mean)

GMT	22	23	24
h	m s	m s	m s
0	+ 1 21.0	+ 1 33.0	+ 1 44.6
6	+ 1 24.0	+ 1 36.0	+ 1 47.4
12	+ 1 27.1	+ 1 38.9	+ 1 50.2
18	+ 1 30.1	+ 1 41.8	+ 1 53.0
24	+ 1 33.0	+ 1 44.6	+ 1 55.7

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
22	2 51	13 19	4 15	15 32	0 22
23	3 43	13 20	4 13	15 29	0 18
24	4 35	13 21	4 10	15 26	0 13
25	5 27	13 22	4 08	15 23	0 09

G M T	♈ GHA	VENUS −3.3 GHA	VENUS Dec.	MARS −0.6 GHA	MARS Dec.	JUPITER −1.6 GHA	JUPITER Dec.	SATURN 0.3 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
25 0	212 28.4	159 40.5	+19 18.5	298 00.3	−24 02.7	128 51.5	+23 10.1	357 42.2	−11 01.8	281 06.7	99	−21 48.0	+75
1	227 30.9	174 39.8	19.3	313 02.0	02.8	143 53.5	10.1	12 44.9	01.7	295 35.6	100	21 40.5	+76
2	242 33.4	189 39.2	20.1	328 03.6	02.8	158 55.4	10.1	27 47.5	01.7	310 04.6	99	21 32.9	+77
3	257 35.8	204 38.5	·· 21.0	343 05.3	·· 02.9	173 57.4	·· 10.1	42 50.2	·· 01.6	324 33.5	100	·21 25.2	+79
4	272 38.3	219 37.9	21.8	358 07.0	03.0	188 59.4	10.2	57 52.8	01.6	339 02.5	100	21 17.3	+79
5	287 40.8	234 37.2	22.7	13 08.6	03.1	204 01.3	10.2	72 55.5	01.5	353 31.5	100	21 09.4	+81
6	302 43.2	249 36.5	+19 23.5	28 10.3	−24 03.1	219 03.3	+23 10.2	87 58.1	−11 01.4	8 00.5	100	−21 01.3	+82
7	317 45.7	264 35.9	24.3	43 12.0	03.2	234 05.2	10.2	103 00.8	01.4	22 29.5	101	20 53.1	+83
8	332 48.2	279 35.2	25.2	58 13.7	03.3	249 07.2	10.3	118 03.4	01.3	36 58.6	101	20 44.8	+84
9	347 50.6	294 34.6	·· 26.0	73 15.3	·· 03.4	264 09.2	·· 10.3	133 06.0	·· 01.2	51 27.7	101	·20 36.4	+86
10	2 53.1	309 33.9	26.9	88 17.0	03.5	279 11.1	10.3	148 08.7	01.2	65 56.8	102	20 27.8	+86
11	17 55.5	324 33.2	27.7	103 18.7	03.5	294 13.1	10.3	163 11.3	01.1	80 26.0	101	20 19.2	+88
12	32 58.0	339 32.6	+19 28.5	118 20.4	−24 03.6	309 15.1	+23 10.4	178 14.0	−11 01.1	94 55.1	102	−20 10.4	+89
13	48 00.5	354 31.9	29.4	133 22.1	03.7	324 17.0	10.4	193 16.6	01.0	109 24.3	102	20 01.5	+90
14	63 02.9	9 31.3	30.2	148 23.7	03.8	339 19.0	10.4	208 19.3	00.9	123 53.5	103	19 52.5	+91
15	78 05.4	24 30.6	·· 31.0	163 25.4	·· 03.9	354 20.9	·· 10.4	223 21.9	·· 00.9	138 22.8	103	·19 43.4	+92
16	93 07.9	39 29.9	31.8	178 27.1	03.9	9 22.9	10.5	238 24.6	00.8	152 52.1	103	19 34.2	+94
17	108 10.3	54 29.3	32.7	193 28.8	04.0	24 24.9	10.5	253 27.2	00.7	167 21.4	103	19 24.8	+94
18	123 12.8	69 28.6	+19 33.5	208 30.5	−24 04.1	39 26.8	+23 10.5	268 29.9	−11 00.7	181 50.7	103	−19 15.4	+96
19	138 15.3	84 28.0	34.3	223 32.2	04.2	54 28.8	10.5	283 32.5	00.6	196 20.0	104	19 05.8	+97
20	153 17.7	99 27.3	35.2	238 33.8	04.3	69 30.8	10.6	298 35.2	00.6	210 49.4	104	18 56.1	+97
21	168 20.2	114 26.6	·· 36.0	253 35.5	·· 04.3	84 32.7	·· 10.6	313 37.8	·· 00.5	225 18.8	104	·18 46.4	+99
22	183 22.7	129 26.0	36.8	268 37.2	04.4	99 34.7	10.6	328 40.5	00.4	239 48.2	105	18 36.5	+100
23	198 25.1	144 25.3	37.6	283 38.9	04.5	114 36.6	10.6	343 43.1	00.4	254 17.7	105	18 26.5	+101
26 0	213 27.6	159 24.6	+19 38.4	298 40.6	−24 04.6	129 38.6	+23 10.7	358 45.8	−11 00.3	268 47.2	105	−18 16.4	+102
1	228 30.0	174 24.0	39.3	313 42.3	04.6	144 40.6	10.7	13 48.4	00.3	283 16.7	105	18 06.2	+103
2	243 32.5	189 23.3	40.1	328 44.0	04.7	159 42.5	10.7	28 51.0	00.2	297 46.2	105	17 55.9	+105
3	258 35.0	204 22.6	·· 40.9	343 45.7	·· 04.8	174 44.5	·· 10.7	43 53.7	·· 00.1	312 15.7	106	·17 45.4	+105
4	273 37.4	219 22.0	41.7	358 47.4	04.9	189 46.4	10.8	58 56.3	00.1	326 45.3	106	17 34.9	+106
5	288 39.9	234 21.3	42.5	13 49.1	05.0	204 48.4	10.8	73 59.0	11 00.0	341 14.9	106	17 24.3	+107
6	303 42.4	249 20.6	+19 43.4	28 50.8	−24 05.0	219 50.4	+23 10.8	89 01.6	−10 59.9	355 44.5	107	−17 13.6	+109
7	318 44.8	264 20.0	44.2	43 52.5	05.1	234 52.3	10.8	104 04.3	59.9	10 14.2	107	17 02.7	+109
8	333 47.3	279 19.3	45.0	58 54.1	05.2	249 54.3	10.9	119 06.9	59.8	24 43.9	107	16 51.8	+110
9	348 49.8	294 18.6	·· 45.8	73 55.8	·· 05.3	264 56.2	·· 10.9	134 09.6	·· 59.8	39 13.6	107	·16 40.8	+112
10	3 52.2	309 18.0	46.6	88 57.5	05.4	279 58.2	10.9	149 12.2	59.7	53 43.3	107	16 29.6	+112
11	18 54.7	324 17.3	47.4	103 59.2	05.4	295 00.2	10.9	164 14.9	59.6	68 13.0	108	16 18.4	+113
12	33 57.1	339 16.6	+19 48.2	119 00.9	−24 05.5	310 02.1	+23 11.0	179 17.5	−10 59.6	82 42.8	108	−16 07.1	+115
13	48 59.6	354 15.9	49.1	134 02.6	05.6	325 04.1	11.0	194 20.2	59.5	97 12.6	108	15 55.6	+115
14	64 02.1	9 15.3	49.9	149 04.3	05.7	340 06.0	11.0	209 22.8	59.5	111 42.4	108	15 44.1	+116
15	79 04.5	24 14.6	·· 50.7	164 06.0	·· 05.8	355 08.0	·· 11.0	224 25.5	·· 59.4	126 12.2	108	·15 32.5	+117
16	94 07.0	39 13.9	51.5	179 07.8	05.8	10 10.0	11.1	239 28.1	59.3	140 42.0	109	15 20.8	+118
17	109 09.5	54 13.2	52.3	194 09.5	05.9	25 11.9	11.1	254 30.8	59.3	155 11.9	109	15 09.0	+119
18	124 11.9	69 12.6	+19 53.1	209 11.2	−24 06.0	40 13.9	+23 11.1	269 33.4	−10 59.2	169 41.8	109	−14 57.1	+120
19	139 14.4	84 11.9	53.9	224 12.9	06.1	55 15.8	11.1	284 36.0	59.1	184 11.7	109	14 45.1	+121
20	154 16.9	99 11.2	54.7	239 14.6	06.2	70 17.8	11.2	299 38.7	59.1	198 41.6	110	14 33.0	+122
21	169 19.3	114 10.5	·· 55.5	254 16.3	·· 06.2	85 19.8	·· 11.2	314 41.3	·· 59.0	213 11.6	109	·14 20.8	+122
22	184 21.8	129 09.9	56.3	269 18.0	06.3	100 21.7	11.2	329 44.0	59.0	227 41.5	110	14 08.6	+124
23	199 24.3	144 09.2	57.1	284 19.7	06.4	115 23.7	11.2	344 46.6	58.9	242 11.5	110	13 56.2	+124
27 0	214 26.7	159 08.5	+19 57.9	299 21.4	−24 06.5	130 25.6	+23 11.3	359 49.3	−10 58.8	256 41.5	110	−13 43.8	+125
1	229 29.2	174 07.8	58.7	314 23.1	06.6	145 27.6	11.3	14 51.9	58.8	271 11.5	110	13 31.3	+126
2	244 31.6	189 07.2	19 59.5	329 24.8	06.7	160 29.5	11.3	29 54.6	58.7	285 41.5	111	13 18.7	+127
3	259 34.1	204 06.5	·20 00.3	344 26.6	·· 06.7	175 31.5	·· 11.3	44 57.2	·· 58.7	300 11.6	110	·13 06.0	+128
4	274 36.6	219 05.8	01.1	359 28.3	06.8	190 33.4	11.4	59 59.9	58.6	314 41.6	111	12 53.2	+129
5	289 39.0	234 05.1	01.9	14 30.0	06.9	205 35.4	11.4	75 02.5	58.5	329 11.7	111	12 40.3	+129
6	304 41.5	249 04.4	+20 02.7	29 31.7	−24 07.0	220 37.4	+23 11.4	90 05.2	−10 58.5	343 41.8	110	−12 27.4	+130
7	319 44.0	264 03.8	03.5	44 33.4	07.1	235 39.3	11.4	105 07.8	58.4	358 11.8	111	12 14.4	+132
8	334 46.4	279 03.1	04.3	59 35.1	07.1	250 41.3	11.5	120 10.5	58.3	12 41.9	112	12 01.2	+131
9	349 48.9	294 02.4	·· 05.1	74 36.9	·· 07.2	265 43.2	·· 11.5	135 13.1	·· 58.3	27 12.1	111	·11 48.1	+133
10	4 51.4	309 01.7	05.9	89 38.6	07.3	280 45.2	11.5	150 15.8	58.2	41 42.2	111	11 34.8	+133
11	19 53.8	324 01.0	06.6	104 40.3	07.4	295 47.1	11.5	165 18.4	58.2	56 12.3	111	11 21.5	+135
12	34 56.3	339 00.4	+20 07.4	119 42.0	−24 07.5	310 49.1	+23 11.6	180 21.0	−10 58.1	70 42.4	112	−11 08.0	+134
13	49 58.7	353 59.7	08.2	134 43.7	07.5	325 51.1	11.6	195 23.7	58.0	85 12.6	111	10 54.6	+136
14	65 01.2	8 59.0	09.0	149 45.5	07.6	340 53.0	11.6	210 26.3	58.0	99 42.7	112	10 41.0	+136
15	80 03.7	23 58.3	·· 09.8	164 47.2	·· 07.7	355 55.0	·· 11.6	225 29.0	·· 57.9	114 12.9	112	·10 27.4	+138
16	95 06.1	38 57.6	10.6	179 48.9	07.8	10 56.9	11.7	240 31.6	57.9	128 43.1	111	10 13.6	+137
17	110 08.6	53 56.9	11.4	194 50.6	07.9	25 58.9	11.7	255 34.3	57.8	143 13.2	112	9 59.9	+139
18	125 11.1	68 56.2	+20 12.2	209 52.4	−24 07.9	41 00.8	+23 11.7	270 36.9	−10 57.7	157 43.4	112	− 9 46.0	+139
19	140 13.5	83 55.6	12.9	224 54.1	08.0	56 02.8	11.7	285 39.6	57.7	172 13.6	111	9 32.1	+140
20	155 16.0	98 54.9	13.7	239 55.8	08.1	71 04.7	11.7	300 42.2	57.6	186 43.7	112	9 18.1	+140
21	170 18.5	113 54.2	·· 14.5	254 57.5	·· 08.2	86 06.7	·· 11.8	315 44.9	·· 57.5	201 13.9	112	· 9 04.1	+142
22	185 20.9	128 53.5	15.3	269 59.3	08.3	101 08.6	11.8	330 47.5	57.5	215 44.1	112	8 49.9	+141
23	200 23.4	143 52.8	16.1	285 01.0	08.4	116 10.6	11.8	345 50.2	57.4	230 14.3	112	8 35.8	+143
24	215 25.9	158 52.1	+20 16.8	300 02.7	−24 08.4	131 12.5	+23 11.8	0 52.8	−10 57.4	244 44.5	111	− 8 21.5	+143
code	—	− 7	+ 9	+ 17	− 1	+ 20	0	+ 27	+ 1				

GMT		SUN GHA	Dec.
	h	° ′	° ′
25	0	180 29.0	+12 56.4
	1	195 29.1	57.2
	2	210 29.2	58.1
	3	225 29.3 ••	58.9
	4	240 29.4	12 59.7
	5	255 29.6	13 00.5
	6	270 29.7	+13 01.3
	7	285 29.8	02.2
	8	300 29.9	03.0
	9	315 30.0 ••	03.8
	10	330 30.1	04.6
	11	345 30.2	05.4
	12	0 30.3	+13 06.3
	13	15 30.4	07.1
	14	30 30.6	07.9
	15	45 30.7 ••	08.7
	16	60 30.8	09.5
	17	75 30.9	10.3
	18	90 31.0	+13 11.1
	19	105 31.1	12.0
	20	120 31.2	12.8
	21	135 31.3 ••	13.6
	22	150 31.4	14.4
	23	165 31.5	15.2
26	0	180 31.6	+13 16.0
	1	195 31.7	16.8
	2	210 31.9	17.7
	3	225 32.0 ••	18.5
	4	240 32.1	19.3
	5	255 32.2	20.1
	6	270 32.3	+13 20.9
	7	285 32.4	21.7
	8	300 32.5	22.5
	9	315 32.6 ••	23.3
	10	330 32.7	24.1
	11	345 32.8	24.9
	12	0 32.9	+13 25.8
	13	15 33.0	26.6
	14	30 33.1	27.4
	15	45 33.2 ••	28.2
	16	60 33.3	29.0
	17	75 33.4	29.8
	18	90 33.6	+13 30.6
	19	105 33.7	31.4
	20	120 33.8	32.2
	21	135 33.9 ••	33.0
	22	150 34.0	33.8
	23	165 34.1	34.6
27	0	180 34.2	+13 35.4
	1	195 34.3	36.2
	2	210 34.4	37.0
	3	225 34.5 ••	37.8
	4	240 34.6	38.6
	5	255 34.7	39.4
	6	270 34.8	+13 40.2
	7	285 34.9	41.0
	8	300 35.0	41.8
	9	315 35.1 ••	42.6
	10	330 35.2	43.4
	11	345 35.3	44.2
	12	0 35.4	+13 45.0
	13	15 35.5	45.8
	14	30 35.6	46.6
	15	45 35.7 ••	47.4
	16	60 35.8	48.2
	17	75 35.9	49.0
	18	90 36.0	+13 49.8
	19	105 36.1	50.6
	20	120 36.2	51.4
	21	135 36.3 ••	52.2
	22	150 36.4	53.0
	23	165 36.5	53.8
	24	180 36.6	+13 54.6
code		—	+ 8

No.	STARS Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 52.3	−40 29.2
5	Achernar	336 00.1	−57 28.0
30	Acrux	173 58.6	−62 51.1
19	Adhara	255 47.5	−28 54.7
10	Aldebaran	291 40.6	+16 25.2
32	Alioth	166 58.8	+56 12.4
34	Alkaid	153 33.2	+49 32.3
55	Al Na'ir	28 39.4	−47 10.8
15	Alnilam	276 31.6	− 1 13.8
25	Alphard	218 39.6	− 8 27.8
41	Alphecca	126 48.2	+26 51.8
1	Alpheratz	358 29.8	+28 50.2
51	Altair	62 51.4	+ 8 44.6
2	Ankaa	353 59.6	−42 33.1
42	Antares	113 20.4	−26 20.1
37	Arcturus	146 35.8	+19 25.0
43	Atria	109 01.7	−68 56.8
22	Avior	234 36.3	−59 22.1
13	Bellatrix	279 19.8	+ 6 18.6
16	Betelg'se	271 49.5	+ 7 24.0
17	Canopus	264 16.1	−52 40.4
12	Capella	281 40.4	+45 57.4
53	Deneb	50 01.8	+45 06.7
28	Denebola	183 18.6	+14 49.5
4	Diphda	349 40.6	−18 14.2
27	Dubhe	194 45.3	+62 00.0
14	Elnath	279 09.0	+28 34.3
47	Eltanin	91 06.4	+51 29.3
54	Enif	34 30.8	+ 9 39.8
56	Fomalhaut	16 13.0	−29 51.8
31	Gacrux	172 50.1	−56 51.8
29	Gienah	176 37.7	−17 17.6
35	Hadar	149 50.4	−60 09.4
6	Hamal	328 51.2	+23 14.8
48	Kaus Aust.	84 42.4	−34 24.5
40	Kochab	137 16.5	+74 20.4
57	Markab	14 22.7	+14 57.5
8	Menkar	315 01.8	+ 3 54.7
36	Menkent	148 59.6	−36 09.0
24	Miapl'dus	221 49.3	−69 32.1
9	Mirfak	309 44.5	+49 42.1
50	Nunki	76 53.1	−26 21.3
52	Peacock	54 28.9	−56 52.8
21	Pollux	244 22.0	+28 08.3
20	Procyon	245 46.2	+ 5 20.5
46	R'alhague	96 47.4	+12 35.3
26	Regulus	208 30.5	+12 11.4
11	Rigel	281 54.9	− 8 15.2
38	Rigil Kent.	140 51.9	−60 39.1
44	Sabik	103 03.2	−15 40.3
3	Schedar	350 31.8	+56 17.2
45	Shaula	97 21.9	−37 04.4
18	Sirius	259 13.0	−16 39.3
33	Spica	159 17.7	−10 55.6
23	Suhail	223 25.1	−43 15.2
49	Vega	81 08.8	+38 44.1
39	Zub'g'bi	137 54.2	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 25	26	27	28
N °	h m	h m	h m	h m	h m	h m
72	2 34	////	■	5 18	4 03	3 26
70	3 02	////	■	4 18	3 40	3 15
68	3 23	////	4 26	3 42	3 22	3 06
66	3 39	////	3 31	3 17	3 07	2 59
64	3 52	////	2 58	2 57	2 55	2 52
62	4 04	////	2 33	2 40	2 44	2 47
60	4 13	////	2 14	2 27	2 35	2 42
58	4 21	0 48	1 58	2 15	2 28	2 38
56	4 29	1 33	1 44	2 05	2 21	2 34
54	4 35	2 00	1 32	1 56	2 14	2 30
52	4 41	2 20	1 21	1 48	2 09	2 27
50	4 46	2 35	1 12	1 40	2 04	2 24
45	4 58	3 07	0 52	1 25	1 53	2 18
40	5 07	3 28	0 36	1 12	1 44	2 13
35	5 15	3 44	0 22	1 01	1 36	2 08
30	5 22	3 58	0 10	0 51	1 29	2 04
20	5 34	4 18	24 34	0 34	1 16	1 57
10	5 45	4 33	24 19	0 19	1 06	1 51
0	5 54	4 44	24 06	0 06	0 56	1 45
10	6 04	4 53	23 52	24 46	0 46	1 39
20	6 14	5 00	23 37	24 35	0 35	1 33
30	6 26	5 04	23 20	24 23	0 23	1 26
35	6 32	5 06	23 10	24 15	0 15	1 22
40	6 40	5 07	22 59	24 07	0 07	1 17
45	6 48	5 08	22 45	23 57	25 12	1 12
50	6 59	5 08	22 29	23 46	25 05	1 05
52	7 03	5 07	22 21	23 40	25 02	1 02
54	7 09	5 08	22 12	23 34	24 59	0 59
56	7 14	5 06	22 02	23 28	24 55	0 55
58	7 21	5 05	21 51	23 20	24 51	0 51
60	7 28	5 05	21 38	23 11	24 46	0 46
S						

Lat.	Sunset	Twlt. ends	Moonset 25	26	27	28
N °	h m	h m	h m	h m	h m	h m
72	21 27	////	■	7 37	10 38	13 00
70	20 58	////	■	8 36	10 59	13 08
68	20 36	////	6 40	9 10	11 15	13 14
66	20 19	////	7 35	9 35	11 28	13 20
64	20 06	////	8 07	9 54	11 39	13 24
62	19 54	////	8 31	10 09	11 48	13 28
60	19 44	////	8 50	10 22	11 56	13 31
58	19 36	23 22	9 05	10 33	12 03	13 34
56	19 28	22 30	9 19	10 42	12 09	13 37
54	19 21	22 01	9 30	10 51	12 14	13 39
52	19 16	21 41	9 40	10 58	12 19	13 41
50	19 10	21 24	9 49	11 05	12 23	13 43
45	18 59	20 53	10 08	11 19	12 33	13 48
40	18 49	20 30	10 24	11 31	12 40	13 51
35	18 41	20 13	10 37	11 41	12 47	13 54
30	18 34	20 00	10 48	11 50	12 53	13 57
20	18 22	19 39	11 07	12 05	13 03	14 01
10	18 11	19 23	11 24	12 18	13 11	14 05
0	18 01	19 12	11 39	12 30	13 19	14 09
10	17 52	19 03	11 54	12 42	13 27	14 12
20	17 41	18 56	12 11	12 54	13 36	14 16
30	17 30	18 51	12 30	13 09	13 45	14 20
35	17 23	18 48	12 40	13 17	13 51	14 22
40	17 16	18 47	12 53	13 26	13 57	14 25
45	17 07	18 46	13 07	13 37	14 04	14 28
50	16 57	18 46	13 25	13 51	14 12	14 32
52	16 52	18 46	13 33	13 57	14 16	14 34
54	16 47	18 46	13 43	14 04	14 21	14 35
56	16 41	18 47	13 53	14 11	14 25	14 37
58	16 34	18 47	14 05	14 19	14 31	14 40
60	16 27	18 48	14 18	14 29	14 36	14 42
S						

GMT	Equation of Time (App.—Mean) 25	26	27
h	m s	m s	m s
0	+ 1 55.7	+ 2 06.4	+ 2 16.5
6	+ 1 58.4	+ 2 08.9	+ 2 18.9
12	+ 2 01.1	+ 2 11.5	+ 2 21.3
18	+ 2 03.7	+ 2 14.0	+ 2 23.7
24	+ 2 06.4	+ 2 16.5	+ 2 26.1

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
25	5 27	13 22	4 08	15 23	0 09
26	6 18	13 23	4 05	15 19	0 05
27	7 08	13 24	4 02	15 16	0 01 / 23 57
28	7 57	13 25	3 59	15 13	23 52

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.2	0.1	0.2
30			
	0.2	0.1	0.2
45			
	0.2	0.1	0.1
60			
	0.2	0.0	0.1
75			
	0.2	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	25	26	27
°	′	′	′
0			
	15.3	16.3	17.5
4			
	15.3	16.3	17.5
8			
	15.3	16.3	17.4
12			
	15.3	16.3	17.4
16			
	15.3	16.3	17.4
20			
	15.3	16.3	17.4
24			
	15.3	16.3	17.3
28			
	15.3	16.2	17.3
32			
	15.3	16.2	17.2
36			
	15.3	16.2	17.1
40			
	15.3	16.2	17.1
44			
	15.4	16.1	17.0
48			
	15.4	16.1	16.9
52			
	15.4	16.1	16.8
56			
	15.4	16.0	16.8
60			
	15.4	16.0	16.7
64			
	15.4	16.0	16.6
68			
	15.4	15.9	16.5
72			
	15.4	15.9	16.4
76			
	15.5	15.8	16.3
80			
	15.5	15.8	16.2
84			
	15.5	15.8	16.1
88			
	15.5	15.7	16.0
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	25	26	27
°	′	′	′
0			
	15.7	15.1	14.5
4			
	15.7	15.1	14.5
8			
	15.7	15.1	14.5
12			
	15.7	15.1	14.5
16			
	15.7	15.1	14.5
20			
	15.7	15.2	14.6
24			
	15.7	15.2	14.6
28			
	15.7	15.2	14.7
32			
	15.7	15.2	14.7
36			
	15.7	15.2	14.8
40			
	15.6	15.3	14.8
44			
	15.6	15.3	14.9
48			
	15.6	15.3	15.0
52			
	15.6	15.4	15.1
56			
	15.6	15.4	15.2
60			
	15.6	15.4	15.3
64			
	15.6	15.5	15.3
68			
	15.6	15.5	15.4
72			
	15.6	15.5	15.5
76			
	15.5	15.6	15.6
80			
	15.5	15.6	15.8
84			
	15.5	15.7	15.9
88			
	15.5	15.7	15.9
90			

Subtract from table, back cover

Last Quarter 26

Day	GMT	♈ GHA	VENUS −3.3 GHA	VENUS Dec.	MARS −0.6 GHA	MARS Dec.	JUPITER −1.6 GHA	JUPITER Dec.	SATURN 0.3 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
28	0	215 25.9	158 52.1	+20 16.8	300 02.7	−24 08.4	131 12.5	+23 11.8	0 52.8	−10 57.4	244 44.5	111	− 8 21.5	+143
	1	230 28.3	173 51.4	17.6	315 04.5	08.5	146 14.5	11.9	15 55.5	57.3	259 14.6	112	8 07.2	+144
	2	245 30.8	188 50.7	18.4	330 06.2	08.6	161 16.5	11.9	30 58.1	57.2	273 44.8	112	7 52.8	+144
	3	260 33.2	203 50.1	•• 19.2	345 07.9	•• 08.7	176 18.4	•• 11.9	46 00.8	•• 57.2	288 15.0	111	· 7 38.4	+145
	4	275 35.7	218 49.4	19.9	0 09.7	08.8	191 20.4	11.9	61 03.4	57.1	302 45.1	112	7 23.9	+145
	5	290 38.2	233 48.7	20.7	15 11.4	08.8	206 22.3	12.0	76 06.0	57.1	317 15.3	111	7 09.4	+146
	6	305 40.6	248 48.0	+20 21.5	30 13.2	−24 08.9	221 24.3	+23 12.0	91 08.7	−10 57.0	331 45.4	112	− 6 54.8	+147
	7	320 43.1	263 47.3	22.3	45 14.9	09.0	236 26.2	12.0	106 11.3	56.9	346 15.6	111	6 40.1	+147
	8	335 45.6	278 46.6	23.0	60 16.6	09.1	251 28.2	12.0	121 14.0	56.9	0 45.7	111	6 25.4	+147
	9	350 48.0	293 45.9	•• 23.8	75 18.4	•• 09.2	266 30.1	•• 12.1	136 16.6	•• 56.8	15 15.8	111	· 6 10.7	+149
	10	5 50.5	308 45.2	24.6	90 20.1	09.3	281 32.1	12.1	151 19.3	56.7	29 45.9	111	5 55.8	+148
	11	20 53.0	323 44.5	25.3	105 21.9	09.3	296 34.0	12.1	166 21.9	56.7	44 16.0	111	5 41.0	+149
	12	35 55.4	338 43.8	+20 26.1	120 23.6	−24 09.4	311 36.0	+23 12.1	181 24.6	−10 56.6	58 46.1	111	− 5 26.1	+150
	13	50 57.9	353 43.1	26.9	135 25.4	09.5	326 37.9	12.2	196 27.2	56.6	73 16.2	110	5 11.1	+150
	14	66 00.4	8 42.4	27.6	150 27.1	09.6	341 39.9	12.2	211 29.9	56.5	87 46.2	110	4 56.1	+150
	15	81 02.8	23 41.7	•• 28.4	165 28.8	•• 09.7	356 41.8	•• 12.2	226 32.5	•• 56.4	102 16.2	111	· 4 41.1	+151
	16	96 05.3	38 41.1	29.2	180 30.6	09.8	11 43.8	12.2	241 35.2	56.4	116 46.3	110	4 26.0	+152
	17	111 07.7	53 40.4	29.9	195 32.3	09.8	26 45.7	12.2	256 37.8	56.3	131 16.3	109	4 10.8	+151
	18	126 10.2	68 39.7	+20 30.7	210 34.1	−24 09.9	41 47.7	+23 12.3	271 40.5	−10 56.3	145 46.2	110	− 3 55.7	+153
	19	141 12.7	83 39.0	31.4	225 35.8	10.0	56 49.6	12.3	286 43.1	56.2	160 16.2	109	3 40.4	+152
	20	156 15.1	98 38.3	32.2	240 37.6	10.1	71 51.6	12.3	301 45.8	56.1	174 46.1	110	3 25.2	+153
	21	171 17.6	113 37.6	•• 33.0	255 39.3	•• 10.2	86 53.5	•• 12.3	316 48.4	•• 56.1	189 16.1	110	· 3 09.9	+153
	22	186 20.1	128 36.9	33.7	270 41.1	10.3	101 55.5	12.4	331 51.1	56.0	203 45.9	109	2 54.6	+154
	23	201 22.5	143 36.2	34.5	285 42.8	10.3	116 57.4	12.4	346 53.7	55.9	218 15.8	109	2 39.2	+154
29	0	216 25.0	158 35.5	+20 35.2	300 44.6	−24 10.4	131 59.4	+23 12.4	1 56.3	−10 55.9	232 45.7	108	− 2 23.8	+154
	1	231 27.5	173 34.8	36.0	315 46.4	10.5	147 01.3	12.4	16 59.0	55.8	247 15.5	108	2 08.4	+155
	2	246 29.9	188 34.1	36.7	330 48.1	10.6	162 03.3	12.5	32 01.6	55.8	261 45.3	107	1 52.9	+154
	3	261 32.4	203 33.4	•• 37.5	345 49.9	•• 10.7	177 05.2	•• 12.5	47 04.3	•• 55.7	276 15.0	108	· 1 37.5	+155
	4	276 34.9	218 32.7	38.2	0 51.6	10.8	192 07.2	12.5	62 06.9	55.6	290 44.8	106	1 22.0	+156
	5	291 37.3	233 32.0	39.0	15 53.4	10.8	207 09.1	12.5	77 09.6	55.6	305 14.4	107	1 06.4	+155
	6	306 39.8	248 31.3	+20 39.7	30 55.2	−24 10.9	222 11.1	+23 12.5	92 12.2	−10 55.5	319 44.1	106	− 0 50.9	+156
	7	321 42.2	263 30.6	40.5	45 56.9	11.0	237 13.0	12.6	107 14.9	55.5	334 13.7	106	0 35.3	+156
	8	336 44.7	278 29.9	41.2	60 58.7	11.1	252 15.0	12.6	122 17.5	55.4	348 43.3	106	0 19.7	+156
	9	351 47.2	293 29.2	•• 42.0	76 00.4	•• 11.2	267 16.9	•• 12.6	137 20.2	•• 55.3	3 12.9	105	− 0 04.1	+157
	10	6 49.6	308 28.5	42.7	91 02.2	11.3	282 18.9	12.6	152 22.8	55.3	17 42.4	105	+ 0 11.6	+156
	11	21 52.1	323 27.7	43.5	106 04.0	11.3	297 20.8	12.7	167 25.5	55.2	32 11.9	105	0 27.2	+157
	12	36 54.6	338 27.0	+20 44.2	121 05.7	−24 11.4	312 22.8	+23 12.7	182 28.1	−10 55.2	46 41.4	104	+ 0 42.9	+157
	13	51 57.0	353 26.3	45.0	136 07.5	11.5	327 24.7	12.7	197 30.8	55.1	61 10.8	103	0 58.6	+157
	14	66 59.5	8 25.6	45.7	151 09.3	11.6	342 26.7	12.7	212 33.4	55.0	75 40.1	104	1 14.3	+157
	15	82 02.0	23 24.9	•• 46.4	166 11.0	•• 11.7	357 28.6	•• 12.8	227 36.1	•• 55.0	90 09.5	103	· 1 30.0	+157
	16	97 04.4	38 24.2	47.2	181 12.8	11.8	12 30.6	12.8	242 38.7	54.9	104 38.8	102	1 45.7	+157
	17	112 06.9	53 23.5	47.9	196 14.6	11.8	27 32.5	12.8	257 41.3	54.8	119 08.0	102	2 01.4	+157
	18	127 09.3	68 22.8	+20 48.7	211 16.3	−24 11.9	42 34.5	+23 12.8	272 44.0	−10 54.8	133 37.2	101	+ 2 17.1	+157
	19	142 11.8	83 22.1	49.4	226 18.1	12.0	57 36.4	12.8	287 46.6	54.7	148 06.3	101	2 32.8	+158
	20	157 14.3	98 21.4	50.1	241 19.9	12.1	72 38.3	12.9	302 49.3	54.7	162 35.4	101	2 48.6	+157
	21	172 16.7	113 20.7	•• 50.9	256 21.7	•• 12.2	87 40.3	•• 12.9	317 51.9	•• 54.6	177 04.5	100	· 3 04.3	+157
	22	187 19.2	128 20.0	51.6	271 23.4	12.3	102 42.2	12.9	332 54.6	54.5	191 33.5	99	3 20.0	+157
	23	202 21.7	143 19.3	52.3	286 25.2	12.4	117 44.2	12.9	347 57.2	54.5	206 02.4	99	3 35.7	+157
30	0	217 24.1	158 18.5	+20 53.1	301 27.0	−24 12.4	132 46.1	+23 13.0	2 59.9	−10 54.4	220 31.3	99	+ 3 51.4	+157
	1	232 26.6	173 17.8	53.8	316 28.8	12.5	147 48.1	13.0	18 02.5	54.4	235 00.2	98	4 07.1	+157
	2	247 29.1	188 17.1	54.5	331 30.6	12.6	162 50.0	13.0	33 05.2	54.3	249 29.0	97	4 22.8	+157
	3	262 31.5	203 16.4	•• 55.3	346 32.3	•• 12.7	177 52.0	•• 13.0	48 07.8	•• 54.2	263 57.7	97	· 4 38.5	+157
	4	277 34.0	218 15.7	56.0	1 34.1	12.8	192 53.9	13.0	63 10.5	54.2	278 26.4	96	4 54.2	+156
	5	292 36.5	233 15.0	56.7	16 35.9	12.9	207 55.9	13.1	78 13.1	54.1	292 55.0	96	5 09.8	+157
	6	307 38.9	248 14.3	+20 57.4	31 37.7	−24 13.0	222 57.8	+23 13.1	93 15.8	−10 54.1	307 23.6	95	+ 5 25.5	+156
	7	322 41.4	263 13.6	58.2	46 39.5	13.0	237 59.8	13.1	108 18.4	54.0	321 52.1	94	5 41.1	+156
	8	337 43.8	278 12.8	58.9	61 41.3	13.1	253 01.7	13.1	123 21.1	53.9	336 20.5	94	5 56.7	+156
	9	352 46.3	293 12.1	·20 59.6	76 43.0	•• 13.2	268 03.6	•• 13.2	138 23.7	•• 53.9	350 48.9	93	· 6 12.3	+156
	10	7 48.8	308 11.4	21 00.3	91 44.8	13.3	283 05.6	13.2	153 26.3	53.8	5 17.2	93	6 27.9	+155
	11	22 51.2	323 10.7	01.0	106 46.6	13.4	298 07.5	13.2	168 29.0	53.7	19 45.5	92	6 43.4	+155
	12	37 53.7	338 10.0	+21 01.8	121 48.4	−24 13.5	313 09.5	+23 13.2	183 31.6	−10 53.7	34 13.7	91	+ 6 58.9	+155
	13	52 56.2	353 09.3	02.5	136 50.2	13.6	328 11.4	13.3	198 34.3	53.6	48 41.8	91	7 14.4	+154
	14	67 58.6	8 08.6	03.2	151 52.0	13.6	343 13.4	13.3	213 36.9	53.6	63 09.9	90	7 29.8	+154
	15	83 01.1	23 07.8	•• 03.9	166 53.8	•• 13.7	358 15.3	•• 13.3	228 39.6	•• 53.5	77 37.9	89	· 7 45.2	+154
	16	98 03.6	38 07.1	04.6	181 55.6	13.8	13 17.2	13.3	243 42.2	53.4	92 05.8	88	8 00.6	+153
	17	113 06.0	53 06.4	05.4	196 57.4	13.9	28 19.2	13.3	258 44.9	53.4	106 33.6	88	8 15.9	+153
	18	128 08.5	68 05.7	+21 06.1	211 59.2	−24 14.0	43 21.1	+23 13.4	273 47.5	−10 53.3	121 01.4	87	+ 8 31.2	+153
	19	143 10.9	83 05.0	06.8	227 01.0	14.1	58 23.1	13.4	288 50.2	53.3	135 29.1	87	8 46.5	+152
	20	158 13.4	98 04.2	07.5	242 02.8	14.2	73 25.0	13.4	303 52.8	53.2	149 56.8	86	9 01.7	+152
	21	173 15.9	113 03.5	•• 08.2	257 04.6	•• 14.2	88 27.0	•• 13.4	318 55.5	•• 53.1	164 24.4	85	· 9 16.9	+151
	22	188 18.3	128 02.8	08.9	272 06.4	14.3	103 28.9	13.5	333 58.1	53.1	178 51.9	84	9 32.0	+151
	23	203 20.8	143 02.1	09.6	287 08.2	14.4	118 30.9	13.5	349 00.7	53.0	193 19.3	83	9 47.1	+150
	24	218 23.3	158 01.4	+21 10.3	302 10.0	−24 14.5	133 32.8	+23 13.5	4 03.4	−10 53.0	207 46.6	83	+10 02.1	+150
	code	—	− 7	+ 8	+ 18	− 1	+ 19	0	+ 27	+ 1				

GMT		SUN GHA	Dec.
	h	° ′	° ′
28	0	180 36.6	+13 54.6
	1	195 36.7	55.4
	2	210 36.8	56.2
	3	225 36.9 ••	57.0
	4	240 36.9	57.8
	5	255 37.0	58.6
	6	270 37.1	+13 59.3
	7	285 37.2	14 00.1
	8	300 37.3	00.9
	9	315 37.4 ••	01.7
	10	330 37.5	02.5
	11	345 37.6	03.3
	12	0 37.7	+14 04.1
	13	15 37.8	04.9
	14	30 37.9	05.7
	15	45 38.0 ••	06.5
	16	60 38.1	07.2
	17	75 38.2	08.0
	18	90 38.3	+14 08.8
	19	105 38.4	09.6
	20	120 38.5	10.4
	21	135 38.6 ••	11.2
	22	150 38.6	12.0
	23	165 38.7	12.7
29	0	180 38.8	+14 13.5
	1	195 38.9	14.3
	2	210 39.0	15.1
	3	225 39.1 ••	15.9
	4	240 39.2	16.7
	5	255 39.3	17.4
	6	270 39.4	+14 18.2
	7	285 39.5	19.0
	8	300 39.6	19.8
	9	315 39.6 ••	20.6
	10	330 39.7	21.4
	11	345 39.8	22.1
	12	0 39.9	+14 22.9
	13	15 40.0	23.7
	14	30 40.1	24.5
	15	45 40.2 ••	25.3
	16	60 40.3	26.0
	17	75 40.4	26.8
	18	90 40.4	+14 27.6
	19	105 40.5	28.4
	20	120 40.6	29.1
	21	135 40.7 ••	29.9
	22	150 40.8	30.7
	23	165 40.9	31.5
30	0	180 41.0	+14 32.2
	1	195 41.0	33.0
	2	210 41.1	33.8
	3	225 41.2 ••	34.6
	4	240 41.3	35.3
	5	255 41.4	36.1
	6	270 41.5	+14 36.9
	7	285 41.6	37.7
	8	300 41.6	38.4
	9	315 41.7 ••	39.2
	10	330 41.8	40.0
	11	345 41.9	40.7
	12	0 42.0	+14 41.5
	13	15 42.1	42.3
	14	30 42.1	43.0
	15	45 42.2 ••	43.8
	16	60 42.3	44.6
	17	75 42.4	45.3
	18	90 42.5	+14 46.1
	19	105 42.6	46.9
	20	120 42.6	47.6
	21	135 42.7 ••	48.4
	22	150 42.8	49.2
	23	165 42.9	49.9
	24	180 43.0	+14 50.7
code		—	+ 8

STARS

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 52.3	−40 29.2
5	Achernar	336 00.1	−57 28.0
30	Acrux	173 58.6	−62 51.1
19	Adhara	255 47.6	−28 54.7
10	Aldebaran	291 40.6	+16 25.2
32	Alioth	166 58.8	+56 12.4
34	Alkaid	153 33.2	+49 32.3
55	Al Na'ir	28 39.4	−47 10.8
15	Alnilam	276 31.6	− 1 13.8
25	Alphard	218 39.6	− 8 27.8
41	Alphecca	126 48.2	+26 51.8
1	Alpheratz	358 29.8	+28 50.2
51	Altair	62 51.4	+ 8 44.6
2	Ankaa	353 59.6	−42 33.1
42	Antares	113 20.4	−26 20.1
37	Arcturus	146 35.8	+19 25.0
43	Atria	109 01.6	−68 56.8
22	Avior	234 36.4	−59 22.1
13	Bellatrix	279 19.8	+ 6 18.6
16	Betelg'se	271 49.5	+ 7 24.0
17	Canopus	264 16.2	−52 40.4
12	Capella	281 40.4	+45 57.4
53	Deneb	50 01.8	+45 06.7
28	Denebola	183 18.6	+14 49.5
4	Diphda	349 40.6	−18 14.2
27	Dubhe	194 45.4	+62 00.0
14	Elnath	279 09.0	+28 34.3
47	Eltanin	91 06.4	+51 29.3
54	Enif	34 30.7	+ 9 39.8
56	Fomalhaut	16 13.0	−29 51.8
31	Gacrux	172 50.1	−56 51.8
29	Gienah	176 37.7	−17 17.6
35	Hadar	149 50.4	−60 09.4
6	Hamal	328 51.2	+23 14.8
48	Kaus Aust.	84 42.4	−34 24.5
40	Kochab	137 16.5	+74 20.4
57	Markab	14 22.7	+14 57.5
8	Menkar	315 01.8	+ 3 54.7
36	Menkent	148 59.6	−36 09.0
24	Miapl'dus	221 49.3	−69 32.1
9	Mirfak	309 44.5	+49 42.1
50	Nunki	76 53.0	−26 21.3
52	Peacock	54 28.8	−56 52.8
21	Pollux	244 22.0	+28 08.3
20	Procyon	245 46.2	+ 5 20.5
46	R'alhague	96 47.4	+12 35.3
26	Regulus	208 30.5	+12 11.4
11	Rigel	281 54.9	− 8 15.2
38	Rigil Kent.	140 51.9	−60 39.1
44	Sabik	103 03.1	−15 40.3
3	Schedar	350 31.8	+56 17.1
45	Shaula	97 21.8	−37 04.4
18	Sirius	259 13.0	−16 39.3
33	Spica	159 17.7	−10 55.6
23	Suhail	223 25.1	−43 15.2
49	Vega	81 08.8	+38 44.1
39	Zub'g'bi	137 54.2	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 28	29	30	1
N °	h m	h m	h m	h m	h m	h m
72	2 12	////	3 26	2 57	2 29	1 56
70	2 45	////	3 15	2 55	2 35	2 13
68	3 09	////	3 06	2 53	2 40	2 26
66	3 27	////	2 59	2 51	2 44	2 36
64	3 42	////	2 52	2 50	2 47	2 45
62	3 54	////	2 47	2 49	2 51	2 53
60	4 05	////	2 42	2 47	2 53	3 00
58	4 14	////	2 38	2 47	2 56	3 06
56	4 22	1 14	2 34	2 46	2 58	3 12
54	4 29	1 47	2 30	2 45	3 00	3 16
52	4 35	2 09	2 27	2 44	3 01	3 21
50	4 41	2 27	2 24	2 44	3 03	3 25
45	4 53	3 00	2 18	2 42	3 07	3 33
40	5 03	3 23	2 13	2 41	3 10	3 41
35	5 12	3 40	2 08	2 40	3 12	3 47
30	5 20	3 54	2 04	2 39	3 15	3 52
20	5 32	4 16	1 57	2 37	3 19	4 02
10	5 44	4 31	1 51	2 36	3 22	4 11
0	5 54	4 43	1 45	2 35	3 26	4 19
10	6 04	4 52	1 39	2 34	3 29	4 27
20	6 15	5 00	1 33	2 32	3 33	4 36
30	6 27	5 06	1 26	2 31	3 37	4 47
35	6 35	5 08	1 22	2 30	3 40	4 52
40	6 43	5 10	1 17	2 29	3 43	4 59
45	6 52	5 12	1 12	2 28	3 46	5 07
50	7 03	5 13	1 05	2 26	3 50	5 17
52	7 08	5 13	1 02	2 26	3 52	5 22
54	7 14	5 12	0 59	2 25	3 54	5 27
56	7 20	5 12	0 55	2 24	3 57	5 32
58	7 27	5 11	0 51	2 24	3 59	5 38
60	7 35	5 11	0 46	2 23	4 02	5 45
S						

Lat.	Sunset	Twlt. ends	Moonset 28	29	30	1
N °	h m	h m	h m	h m	h m	h m
72	21 49	////	13 00	15 17	17 42	20 31
70	21 14	////	13 08	15 15	17 28	19 56
68	20 49	////	13 14	15 13	17 18	19 32
66	20 30	////	13 20	15 12	17 09	19 13
64	20 15	////	13 24	15 11	17 02	18 58
62	20 02	////	13 28	15 10	16 55	18 46
60	19 52	////	13 31	15 09	16 50	18 35
58	19 42	////	13 34	15 08	16 45	18 26
56	19 34	22 49	13 37	15 07	16 41	18 18
54	19 27	22 14	13 39	15 07	16 37	18 11
52	19 21	21 51	13 41	15 06	16 34	18 04
50	19 15	21 32	13 43	15 06	16 31	17 59
45	19 02	20 58	13 48	15 05	16 24	17 46
40	18 52	20 35	13 51	15 04	16 19	17 36
35	18 43	20 16	13 54	15 03	16 14	17 28
30	18 36	20 02	13 57	15 02	16 10	17 20
20	18 23	19 41	14 01	15 01	16 03	17 07
10	18 11	19 24	14 05	15 00	15 57	16 56
0	18 01	19 12	14 09	14 59	15 51	16 45
10	17 50	19 02	14 12	14 58	15 45	16 35
20	17 39	18 54	14 16	14 56	15 39	16 24
30	17 27	18 48	14 20	14 55	15 31	16 11
35	17 20	18 46	14 22	14 54	15 28	16 04
40	17 12	18 44	14 25	14 53	15 23	15 55
45	17 02	18 41	14 28	14 52	15 18	15 46
50	16 51	18 41	14 32	14 51	15 11	15 34
52	16 46	18 41	14 34	14 50	15 08	15 29
54	16 40	18 40	14 35	14 50	15 05	15 23
56	16 34	18 41	14 37	14 49	15 02	15 16
58	16 27	18 41	14 40	14 48	14 58	15 09
60	16 19	18 42	14 42	14 48	14 54	15 01
S						

GMT	Equation of Time (App.—Mean) 28	29	30
h	m s	m s	m s
0	+ 2 26.1	+ 2 35.1	+ 2 43.7
6	+ 2 28.4	+ 2 37.3	+ 2 45.7
12	+ 2 30.7	+ 2 39.5	+ 2 47.7
18	+ 2 32.9	+ 2 41.6	+ 2 49.7
24	+ 2 35.1	+ 2 43.7	+ 2 51.7

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
28	7 57	13 25	3 59	15 13	23 52
29	8 47	13 26	3 57	15 10	23 48
30	9 38	13 27	3 54	15 07	23 44
1	10 32	13 29	3 51	15 04	23 40

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.2	0.1	0.2
30			
	0.2	0.1	0.2
45			
	0.2	0.1	0.1
60			
	0.2	0.0	0.1
75			
	0.2	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	28	29	30
°	′	′	′
0			
	18.6	19.6	20.4
4			
	18.6	19.6	20.4
8			
	18.6	19.6	20.3
12			
	18.5	19.5	20.3
16			
	18.5	19.5	20.2
20			
	18.4	19.4	20.1
24			
	18.4	19.3	20.0
28			
	18.3	19.2	19.9
32			
	18.2	19.1	19.7
36			
	18.1	18.9	19.6
40			
	18.0	18.8	19.4
44			
	17.9	18.6	19.2
48			
	17.7	18.5	19.0
52			
	17.6	18.3	18.8
56			
	17.5	18.1	18.6
60			
	17.3	17.9	18.4
64			
	17.2	17.7	18.1
68			
	17.0	17.5	17.9
72			
	16.9	17.3	17.6
76			
	16.7	17.1	17.4
80			
	16.5	16.9	17.1
84			
	16.4	16.6	16.9
88			
	16.2	16.5	16.7
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	28	29	30
°	′	′	′
0			
	13.8	13.2	12.8
4			
	13.8	13.2	12.8
8			
	13.8	13.3	12.8
12			
	13.9	13.3	12.9
16			
	13.9	13.4	13.0
20			
	14.0	13.5	13.1
24			
	14.0	13.5	13.2
28			
	14.1	13.6	13.3
32			
	14.2	13.8	13.4
36			
	14.3	13.9	13.6
40			
	14.4	14.0	13.8
44			
	14.5	14.2	13.9
48			
	14.7	14.4	14.1
52			
	14.8	14.5	14.3
56			
	14.9	14.7	14.6
60			
	15.1	14.9	14.8
64			
	15.2	15.1	15.0
68			
	15.4	15.3	15.3
72			
	15.5	15.5	15.5
76			
	15.7	15.8	15.8
80			
	15.9	16.0	16.1
84			
	16.0	16.2	16.3
88			
	16.2	16.4	16.5
90			

Subtract from table, back cover

GMT		♈ GHA	VENUS −3.3 GHA	VENUS Dec.	MARS −0.7 GHA	MARS Dec.	JUPITER −1.6 GHA	JUPITER Dec.	SATURN 0.4 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
1	0	218 23.3	158 01.4	+21 10.3	302 10.0	−24 14.5	133 32.8	+23 13.5	4 03.4	−10 53.0	207 46.6	83	+10 02.1	+150
	1	233 25.7	173 00.6	11.0	317 11.8	14.6	148 34.7	13.5	19 06.0	52.9	222 13.9	82	10 17.1	+149
	2	248 28.2	187 59.9	11.7	332 13.6	14.7	163 36.7	13.5	34 08.7	52.8	236 41.1	81	10 32.0	+149
	3	263 30.7	202 59.2	·· 12.5	347 15.4	·· 14.8	178 38.6	·· 13.6	49 11.3	·· 52.8	251 08.2	81	·10 46.9	+148
	4	278 33.1	217 58.5	13.2	2 17.2	14.9	193 40.6	13.6	64 14.0	52.7	265 35.3	80	11 01.7	+147
	5	293 35.6	232 57.8	13.9	17 19.0	14.9	208 42.5	13.6	79 16.6	52.7	280 02.3	78	11 16.4	+147
	6	308 38.1	247 57.0	+21 14.6	32 20.8	−24 15.0	223 44.4	+23 13.6	94 19.3	−10 52.6	294 29.1	79	+11 31.1	+146
	7	323 40.5	262 56.3	15.3	47 22.6	15.1	238 46.4	13.7	109 21.9	52.5	308 56.0	77	11 45.7	+145
	8	338 43.0	277 55.6	16.0	62 24.4	15.2	253 48.3	13.7	124 24.6	52.5	323 22.7	76	12 00.2	+145
	9	353 45.4	292 54.9	·· 16.7	77 26.2	·· 15.3	268 50.3	·· 13.7	139 27.2	·· 52.4	337 49.3	76	·12 14.7	+144
	10	8 47.9	307 54.1	17.4	92 28.0	15.4	283 52.2	13.7	154 29.9	52.4	352 15.9	75	12 29.1	+143
	11	23 50.4	322 53.4	18.1	107 29.8	15.5	298 54.2	13.7	169 32.5	52.3	6 42.4	74	12 43.4	+143
	12	38 52.8	337 52.7	+21 18.8	122 31.6	−24 15.6	313 56.1	+23 13.8	184 35.2	−10 52.2	21 08.8	73	+12 57.7	+142
	13	53 55.3	352 51.9	19.4	137 33.5	15.6	328 58.0	13.8	199 37.8	52.2	35 35.1	73	13 11.9	+141
	14	68 57.8	7 51.2	20.1	152 35.3	15.7	344 00.0	13.8	214 40.4	52.1	50 01.4	71	13 26.0	+140
	15	84 00.2	22 50.5	·· 20.8	167 37.1	·· 15.8	359 01.9	·· 13.8	229 43.1	·· 52.1	64 27.5	71	·13 40.0	+139
	16	99 02.7	37 49.8	21.5	182 38.9	15.9	14 03.9	13.8	244 45.7	52.0	78 53.6	70	13 53.9	+138
	17	114 05.2	52 49.0	22.2	197 40.7	16.0	29 05.8	13.9	259 48.4	51.9	93 19.6	69	14 07.7	+138
	18	129 07.6	67 48.3	+21 22.9	212 42.5	−24 16.1	44 07.7	+23 13.9	274 51.0	−10 51.9	107 45.5	68	+14 21.5	+137
	19	144 10.1	82 47.6	23.6	227 44.4	16.2	59 09.7	13.9	289 53.7	51.8	122 11.3	67	14 35.2	+135
	20	159 12.6	97 46.8	24.3	242 46.2	16.3	74 11.6	13.9	304 56.3	51.7	136 37.0	67	14 48.7	+135
	21	174 15.0	112 46.1	·· 25.0	257 48.0	·· 16.4	89 13.6	·· 14.0	319 59.0	·· 51.7	151 02.7	65	·15 02.2	+134
	22	189 17.5	127 45.4	25.7	272 49.8	16.4	104 15.5	14.0	335 01.6	51.6	165 28.2	65	15 15.6	+133
	23	204 19.9	142 44.7	26.3	287 51.7	16.5	119 17.4	14.0	350 04.3	51.6	179 53.7	64	15 28.9	+132
2	0	219 22.4	157 43.9	+21 27.0	302 53.5	−24 16.6	134 19.4	+23 14.0	5 06.9	−10 51.5	194 19.1	63	+15 42.1	+130
	1	234 24.9	172 43.2	27.7	317 55.3	16.7	149 21.3	14.0	20 09.6	51.4	208 44.4	62	15 55.1	+130
	2	249 27.3	187 42.5	28.4	332 57.1	16.8	164 23.2	14.1	35 12.2	51.4	223 09.6	61	16 08.1	+129
	3	264 29.8	202 41.7	·· 29.1	347 59.0	·· 16.9	179 25.2	·· 14.1	50 14.8	·· 51.3	237 34.7	61	·16 21.0	+127
	4	279 32.3	217 41.0	29.8	3 00.8	17.0	194 27.1	14.1	65 17.5	51.3	251 59.8	60	16 33.7	+127
	5	294 34.7	232 40.3	30.4	18 02.6	17.1	209 29.1	14.1	80 20.1	51.2	266 24.8	58	16 46.4	+125
	6	309 37.2	247 39.5	+21 31.1	33 04.4	−24 17.2	224 31.0	+23 14.1	95 22.8	−10 51.1	280 49.6	58	+16 58.9	+124
	7	324 39.7	262 38.8	31.8	48 06.3	17.2	239 32.9	14.2	110 25.4	51.1	295 14.4	57	17 11.3	+123
	8	339 42.1	277 38.1	32.5	63 08.1	17.3	254 34.9	14.2	125 28.1	51.0	309 39.1	57	17 23.6	+122
	9	354 44.6	292 37.3	·· 33.1	78 09.9	·· 17.4	269 36.8	·· 14.2	140 30.7	·· 51.0	324 03.8	55	·17 35.8	+121
	10	9 47.0	307 36.6	33.8	93 11.8	17.5	284 38.8	14.2	155 33.4	50.9	338 28.3	55	17 47.9	+119
	11	24 49.5	322 35.8	34.5	108 13.6	17.6	299 40.7	14.2	170 36.0	50.8	352 52.8	54	17 59.8	+118
	12	39 52.0	337 35.1	+21 35.2	123 15.5	−24 17.7	314 42.6	+23 14.3	185 38.7	−10 50.8	7 17.2	53	+18 11.6	+117
	13	54 54.4	352 34.4	35.8	138 17.3	17.8	329 44.6	14.3	200 41.3	50.7	21 41.5	52	18 23.3	+116
	14	69 56.9	7 33.6	36.5	153 19.1	17.9	344 46.5	14.3	215 44.0	50.7	36 05.7	51	18 34.9	+114
	15	84 59.4	22 32.9	·· 37.2	168 21.0	·· 18.0	359 48.4	·· 14.3	230 46.6	·· 50.6	50 29.8	50	·18 46.3	+113
	16	100 01.8	37 32.2	37.8	183 22.8	18.1	14 50.4	14.4	245 49.2	50.5	64 53.8	50	18 57.6	+111
	17	115 04.3	52 31.4	38.5	198 24.7	18.1	29 52.3	14.4	260 51.9	50.5	79 17.8	49	19 08.7	+111
	18	130 06.8	67 30.7	+21 39.2	213 26.5	−24 18.2	44 54.2	+23 14.4	275 54.5	−10 50.4	93 41.7	48	+19 19.8	+109
	19	145 09.2	82 29.9	39.8	228 28.3	18.3	59 56.2	14.4	290 57.2	50.4	108 05.5	48	19 30.7	+107
	20	160 11.7	97 29.2	40.5	243 30.2	18.4	74 58.1	14.4	305 59.8	50.3	122 29.3	46	19 41.4	+106
	21	175 14.2	112 28.5	·· 41.2	258 32.0	·· 18.5	90 00.1	·· 14.5	321 02.5	·· 50.2	136 52.9	46	·19 52.0	+105
	22	190 16.6	127 27.7	41.8	273 33.9	18.6	105 02.0	14.5	336 05.1	50.2	151 16.5	45	20 02.5	+103
	23	205 19.1	142 27.0	42.5	288 35.7	18.7	120 03.9	14.5	351 07.8	50.1	165 40.0	44	20 12.8	+101
3	0	220 21.5	157 26.2	+21 43.1	303 37.6	−24 18.8	135 05.9	+23 14.5	6 10.4	−10 50.1	180 03.4	44	+20 22.9	+101
	1	235 24.0	172 25.5	43.8	318 39.4	18.9	150 07.8	14.5	21 13.1	50.0	194 26.8	43	20 33.0	+ 98
	2	250 26.5	187 24.7	44.5	333 41.3	19.0	165 09.7	14.6	36 15.7	49.9	208 50.1	42	20 42.8	+ 98
	3	265 28.9	202 24.0	·· 45.1	348 43.1	·· 19.1	180 11.7	·· 14.6	51 18.3	·· 49.9	223 13.3	42	·20 52.6	+ 95
	4	280 31.4	217 23.3	45.8	3 45.0	19.1	195 13.6	14.6	66 21.0	49.8	237 36.5	41	21 02.1	+ 94
	5	295 33.9	232 22.5	46.4	18 46.8	19.2	210 15.5	14.6	81 23.6	49.8	251 59.6	40	21 11.5	+ 93
	6	310 36.3	247 21.8	+21 47.1	33 48.7	−24 19.3	225 17.5	+23 14.6	96 26.3	−10 49.7	266 22.6	39	+21 20.8	+ 91
	7	325 38.8	262 21.0	47.7	48 50.6	19.4	240 19.4	14.7	111 28.9	49.6	280 45.5	39	21 29.9	+ 89
	8	340 41.3	277 20.3	48.4	63 52.4	19.5	255 21.3	14.7	126 31.6	49.6	295 08.4	39	21 38.8	+ 88
	9	355 43.7	292 19.5	·· 49.0	78 54.3	·· 19.6	270 23.3	·· 14.7	141 34.2	·· 49.5	309 31.3	37	·21 47.6	+ 86
	10	10 46.2	307 18.8	49.7	93 56.1	19.7	285 25.2	14.7	156 36.9	49.5	323 54.0	37	21 56.2	+ 84
	11	25 48.7	322 18.0	50.3	108 58.0	19.8	300 27.1	14.8	171 39.5	49.4	338 16.7	37	22 04.6	+ 83
	12	40 51.1	337 17.3	+21 51.0	123 59.9	−24 19.9	315 29.1	+23 14.8	186 42.2	−10 49.3	352 39.4	36	+22 12.9	+ 81
	13	55 53.6	352 16.5	51.6	139 01.7	20.0	330 31.0	14.8	201 44.8	49.3	7 02.0	35	22 21.0	+ 80
	14	70 56.0	7 15.8	52.3	154 03.6	20.1	345 32.9	14.8	216 47.4	49.2	21 24.5	35	22 29.0	+ 77
	15	85 58.5	22 15.0	·· 52.9	169 05.4	·· 20.2	0 34.9	·· 14.8	231 50.1	·· 49.2	35 47.0	35	·22 36.7	+ 77
	16	101 01.0	37 14.3	53.6	184 07.3	20.2	15 36.8	14.9	246 52.7	49.1	50 09.5	34	22 44.4	+ 74
	17	116 03.4	52 13.6	54.2	199 09.2	20.3	30 38.7	14.9	261 55.4	49.0	64 31.9	33	22 51.8	+ 73
	18	131 05.9	67 12.8	+21 54.8	214 11.0	−24 20.4	45 40.7	+23 14.9	276 58.0	−10 49.0	78 54.2	33	+22 59.1	+ 70
	19	146 08.4	82 12.1	55.5	229 12.9	20.5	60 42.6	14.9	292 00.7	48.9	93 16.5	33	23 06.1	+ 70
	20	161 10.8	97 11.3	56.1	244 14.8	20.6	75 44.5	14.9	307 03.3	48.9	107 38.8	32	23 13.1	+ 67
	21	176 13.3	112 10.5	·· 56.8	259 16.7	·· 20.7	90 46.5	·· 15.0	322 06.0	·· 48.8	122 01.0	32	·23 19.8	+ 66
	22	191 15.8	127 09.8	57.4	274 18.5	20.8	105 48.4	15.0	337 08.6	48.7	136 23.2	32	23 26.4	+ 63
	23	206 18.2	142 09.0	58.0	289 20.4	20.9	120 50.3	15.0	352 11.3	48.7	150 45.4	31	23 32.7	+ 62
	24	221 20.7	157 08.3	+21 58.7	304 22.3	−24 21.0	135 52.3	+23 15.0	7 13.9	−10 48.6	165 07.5	31	+23 38.9	+ 61
code		–	− 7	+ 6	+ 18	− 1	+ 20	0	+ 26	+ 1				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
1 0	180 43.0	+14 50.7
1	195 43.0	51.5
2	210 43.1	52.2
3	225 43.2 ••	53.0
4	240 43.3	53.8
5	255 43.4	54.5
6	270 43.4	+14 55.3
7	285 43.5	56.1
8	300 43.6	56.8
9	315 43.7 ••	57.6
10	330 43.7	58.3
11	345 43.8	59.1
12	0 43.9	+14 59.9
13	15 44.0	15 00.6
14	30 44.1	01.4
15	45 44.1 ••	02.1
16	60 44.2	02.9
17	75 44.3	03.6
18	90 44.4	+15 04.4
19	105 44.4	05.2
20	120 44.5	05.9
21	135 44.6 ••	06.7
22	150 44.7	07.4
23	165 44.7	08.2
2 0	180 44.8	+15 08.9
1	195 44.9	09.7
2	210 45.0	10.4
3	225 45.0 ••	11.2
4	240 45.1	11.9
5	255 45.2	12.7
6	270 45.3	+15 13.5
7	285 45.3	14.2
8	300 45.4	15.0
9	315 45.5 ••	15.7
10	330 45.6	16.5
11	345 45.6	17.2
12	0 45.7	+15 18.0
13	15 45.8	18.7
14	30 45.8	19.5
15	45 45.9 ••	20.2
16	60 46.0	20.9
17	75 46.1	21.7
18	90 46.1	+15 22.4
19	105 46.2	23.2
20	120 46.3	23.9
21	135 46.3 ••	24.7
22	150 46.4	25.4
23	165 46.5	26.2
3 0	180 46.5	+15 26.9
1	195 46.6	27.7
2	210 46.7	28.4
3	225 46.7 ••	29.1
4	240 46.8	29.9
5	255 46.9	30.6
6	270 47.0	+15 31.4
7	285 47.0	32.1
8	300 47.1	32.8
9	315 47.2 ••	33.6
10	330 47.2	34.3
11	345 47.3	35.1
12	0 47.4	+15 35.8
13	15 47.4	36.5
14	30 47.5	37.3
15	45 47.6 ••	38.0
16	60 47.6	38.7
17	75 47.7	39.5
18	90 47.7	+15 40.2
19	105 47.8	41.0
20	120 47.9	41.7
21	135 47.9 ••	42.4
22	150 48.0	43.2
23	165 48.1	43.9
24	180 48.1	+15 44.6
code	—	+ 7

STARS No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 52.3	−40 29.2
5	Achernar	336 00.1	−57 27.9
30	Acrux	173 58.6	−62 51.1
19	Adhara	255 47.6	−28 54.7
10	Aldebaran	291 40.6	+16 25.2
32	Alioth	166 58.9	+56 12.4
34	Alkaid	153 33.2	+49 32.3
55	Al Na'ir	28 39.3	−47 10.8
15	Alnilam	276 31.6	− 1 13.8
25	Alphard	218 39.6	− 8 27.8
41	Alphecca	126 48.1	+26 51.8
1	Alpheratz	358 29.7	+28 50.2
51	Altair	62 51.4	+ 8 44.6
2	Ankaa	353 59.6	−42 33.1
42	Antares	113 20.4	−26 20.1
37	Arcturus	146 35.8	+19 25.0
43	Atria	109 01.6	−68 56.8
22	Avior	234 36.4	−59 22.1
13	Bellatrix	279 19.8	+ 6 18.6
16	Betelg'se	271 49.5	+ 7 24.0
17	Canopus	264 16.2	−52 40.4
12	Capella	281 40.4	+45 57.4
53	Deneb	50 01.7	+45 06.7
28	Denebola	183 18.6	+14 49.5
4	Diphda	349 40.6	−18 14.1
27	Dubhe	194 45.4	+62 00.0
14	Elnath	279 09.0	+28 34.3
47	Eltanin	91 06.4	+51 29.3
54	Enif	34 30.7	+ 9 39.8
56	Fomalhaut	16 12.9	−29 51.7
31	Gacrux	172 50.1	−56 51.8
29	Gienah	176 37.7	−17 17.6
35	Hadar	149 50.4	−60 09.5
6	Hamal	328 51.2	+23 14.8
48	Kaus Aust.	84 42.3	−34 24.5
40	Kochab	137 16.5	+74 20.4
57	Markab	14 22.7	+14 57.5
8	Menkar	315 01.8	+ 3 54.7
36	Menkent	148 59.6	−36 09.0
24	Miapl'dus	221 49.4	−69 32.1
9	Mirfak	309 44.5	+49 42.1
50	Nunki	76 53.0	−26 21.3
52	Peacock	54 28.8	−56 52.8
21	Pollux	244 22.0	+28 08.3
20	Procyon	245 46.2	+ 5 20.5
46	R'alhague	96 47.3	+12 35.3
26	Regulus	208 30.5	+12 11.4
11	Rigel	281 54.9	− 8 15.2
38	Rigil Kent.	140 51.9	−60 39.1
44	Sabik	103 03.1	−15 40.3
3	Schedar	350 31.8	+56 17.1
45	Shaula	97 21.8	−37 04.4
18	Sirius	259 13.0	−16 39.3
33	Spica	159 17.7	−10 55.6
23	Suhail	223 25.1	−43 15.2
49	Vega	81 08.7	+38 44.1
39	Zub'g'bi	137 54.2	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 1	2	3	4
N °	h m	h m	h m	h m	h m	h m
72	1 48	////	1 56	1 04	□	□
70	2 28	////	2 13	1 41	□	□
68	2 55	////	2 26	2 07	1 34	□
66	3 15	////	2 36	2 28	2 15	1 45
64	3 32	////	2 45	2 44	2 44	2 49
62	3 45	////	2 53	2 58	3 06	3 24
60	3 57	////	3 00	3 09	3 24	3 50
58	4 06	////	3 06	3 20	3 39	4 10
56	4 15	0 50	3 12	3 29	3 52	4 27
54	4 23	1 32	3 16	3 37	4 03	4 41
52	4 29	1 58	3 21	3 44	4 13	4 54
50	4 36	2 17	3 25	3 50	4 22	5 05
45	4 49	2 52	3 33	4 04	4 41	5 28
40	5 00	3 17	3 41	4 16	4 57	5 47
35	5 09	3 36	3 47	4 26	5 10	6 02
30	5 17	3 51	3 52	4 34	5 22	6 16
20	5 31	4 13	4 02	4 50	5 42	6 39
10	5 42	4 30	4 11	5 03	6 00	7 00
0	5 54	4 43	4 19	5 16	6 16	7 19
10	6 05	4 52	4 27	5 29	6 33	7 38
20	6 16	5 01	4 36	5 42	6 50	7 59
30	6 29	5 08	4 47	5 58	7 11	8 22
35	6 37	5 10	4 52	6 07	7 23	8 36
40	6 45	5 12	4 59	6 18	7 37	8 53
45	6 55	5 14	5 07	6 31	7 54	9 12
50	7 07	5 16	5 17	6 46	8 15	9 37
52	7 13	5 16	5 22	6 53	8 24	9 49
54	7 19	5 16	5 27	7 01	8 36	10 02
56	7 26	5 17	5 32	7 10	8 48	10 18
58	7 34	5 16	5 38	7 21	9 03	10 37
60	7 42	5 17	5 45	7 33	9 21	11 00
S						

Lat.	Sunset	Twlt. ends	Moonset 1	2	3	4
N °	h m	h m	h m	h m	h m	h m
72	22 14	////	20 31	□	□	□
70	21 31	////	19 56	□	□	□
68	21 02	////	19 32	22 09	□	□
66	20 41	////	19 13	21 29	24 11	0 11
64	20 25	////	18 58	21 01	23 07	24 58
62	20 11	////	18 46	20 40	22 33	24 07
60	19 59	////	18 35	20 23	22 07	23 35
58	19 49	////	18 26	20 09	21 47	23 12
56	19 40	23 15	18 18	19 57	21 31	22 52
54	19 33	22 29	18 11	19 46	21 17	22 36
52	19 26	22 01	18 04	19 36	21 05	22 23
50	19 19	21 40	17 59	19 28	20 54	22 11
45	19 06	21 04	17 46	19 10	20 32	21 46
40	18 55	20 39	17 36	18 56	20 14	21 26
35	18 46	20 20	17 28	18 43	19 58	21 09
30	18 38	20 05	17 20	18 33	19 45	20 54
20	18 24	19 42	17 07	18 14	19 23	20 30
10	18 12	19 25	16 56	17 59	19 04	20 09
0	18 00	19 11	16 45	17 44	18 46	19 49
10	17 50	19 02	16 35	17 29	18 28	19 29
20	17 38	18 53	16 24	17 13	18 08	19 08
30	17 25	18 46	16 11	16 56	17 46	18 44
35	17 17	18 43	16 04	16 45	17 33	18 29
40	17 08	18 40	15 55	16 33	17 19	18 13
45	16 58	18 38	15 46	16 19	17 01	17 53
50	16 46	18 36	15 34	16 03	16 39	17 28
52	16 41	18 36	15 29	15 55	16 29	17 16
54	16 34	18 35	15 23	15 46	16 17	17 02
56	16 28	18 35	15 16	15 36	16 04	16 46
58	16 20	18 35	15 09	15 25	15 49	16 27
60	16 11	18 35	15 01	15 12	15 31	16 04
S						

GMT	Equation of Time (App.—Mean) 1	2	3
h	m s	m s	m s
0	+ 2 51.7	+ 2 59.1	+ 3 06.0
6	+ 2 53.6	+ 3 00.9	+ 3 07.7
12	+ 2 55.5	+ 3 02.6	+ 3 09.3
18	+ 2 57.3	+ 3 04.4	+ 3 10.9
24	+ 2 59.1	+ 3 06.0	+ 3 12.4

GMT of Transit
Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
1	10 32	13 29	3 51	15 04	23 40
2	11 30	13 30	3 48	15 01	23 35
3	12 31	13 31	3 45	14 58	23 31
4	13 34	13 32	3 42	14 55	23 27

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.2	0.1	0.2
30			
	0.2	0.1	0.2
45			
	0.2	0.1	0.1
60			
	0.2	0.0	0.1
75			
	0.2	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	1	2	3
°	′	′	′
0			
	20.9	21.0	20.8
4			
	20.9	21.0	20.7
8			
	20.8	21.0	20.7
12			
	20.8	20.9	20.6
16			
	20.7	20.8	20.6
20			
	20.6	20.7	20.5
24			
	20.5	20.6	20.4
28			
	20.3	20.4	20.2
32			
	20.2	20.3	20.1
36			
	20.0	20.1	19.9
40			
	19.8	19.9	19.7
44			
	19.6	19.7	19.5
48			
	19.4	19.5	19.3
52			
	19.2	19.2	19.1
56			
	18.9	19.0	18.8
60			
	18.7	18.7	18.6
64			
	18.4	18.5	18.3
68			
	18.1	18.2	18.1
72			
	17.9	17.9	17.8
76			
	17.6	17.6	17.5
80			
	17.3	17.3	17.2
84			
	17.0	17.0	17.0
88			
	16.8	16.8	16.7
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	1	2	3
°	′	′	′
0			
	12.5	12.4	12.6
4			
	12.5	12.5	12.6
8			
	12.6	12.5	12.6
12			
	12.6	12.5	12.7
16			
	12.7	12.6	12.8
20			
	12.8	12.7	12.9
24			
	12.9	12.9	13.0
28			
	13.1	13.0	13.1
32			
	13.2	13.2	13.3
36			
	13.4	13.3	13.4
40			
	13.6	13.5	13.6
44			
	13.8	13.7	13.8
48			
	14.0	14.0	14.0
52			
	14.2	14.2	14.3
56			
	14.5	14.4	14.5
60			
	14.7	14.7	14.7
64			
	15.0	15.0	15.0
68			
	15.3	15.2	15.3
72			
	15.5	15.5	15.5
76			
	15.8	15.8	15.8
80			
	16.1	16.1	16.1
84			
	16.4	16.4	16.4
88			
	16.6	16.6	16.6
90			

Subtract from table, back cover

New Moon 2

GMT	♈ GHA	VENUS −3.3 GHA	VENUS Dec.	MARS −0.8 GHA	MARS Dec.	JUPITER −1.5 GHA	JUPITER Dec.	SATURN 0.4 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
4 0	221 20.7	157 08.3	+21 58.7	304 22.3	−24 21.0	135 52.3	+23 15.0	7 13.9	−10 48.6	165 07.5	31	+23 38.9	+ 61
1	236 23.1	172 07.5	59.3	319 24.1	21.1	150 54.2	15.0	22 16.5	48.6	179 29.6	30	23 45.0	+ 58
2	251 25.6	187 06.8	21 59.9	334 26.0	21.2	165 56.1	15.1	37 19.2	48.5	193 51.6	30	23 50.8	+ 57
3	266 28.1	202 06.0	·22 00.6	349 27.9	·· 21.3	180 58.1	·· 15.1	52 21.8	·· 48.4	208 13.6	30	·23 56.5	+ 55
4	281 30.5	217 05.3	01.2	4 29.8	21.4	196 00.0	15.1	67 24.5	48.4	222 35.6	30	24 02.0	+ 53
5	296 33.0	232 04.5	01.8	19 31.7	21.5	211 01.9	15.1	82 27.1	48.3	236 57.6	30	24 07.3	+ 51
6	311 35.5	247 03.8	+22 02.4	34 33.5	−24 21.6	226 03.9	+23 15.1	97 29.8	−10 48.3	251 19.6	29	+24 12.4	+ 49
7	326 37.9	262 03.0	03.1	49 35.4	21.6	241 05.8	15.2	112 32.4	48.2	265 41.5	30	24 17.3	+ 48
8	341 40.4	277 02.3	03.7	64 37.3	21.7	256 07.7	15.2	127 35.1	48.1	280 03.5	29	24 22.1	+ 45
9	356 42.9	292 01.5	·· 04.3	79 39.2	·· 21.8	271 09.7	·· 15.2	142 37.7	·· 48.1	294 25.4	29	·24 26.6	+ 44
10	11 45.3	307 00.8	04.9	94 41.1	21.9	286 11.6	15.2	157 40.4	48.0	308 47.3	29	24 31.0	+ 42
11	26 47.8	322 00.0	05.6	109 43.0	22.0	301 13.5	15.2	172 43.0	48.0	323 09.2	29	24 35.2	+ 40
12	41 50.3	336 59.2	+22 06.2	124 44.8	−24 22.1	316 15.5	+23 15.3	187 45.6	−10 47.9	337 31.1	29	+24 39.2	+ 39
13	56 52.7	351 58.5	06.8	139 46.7	22.2	331 17.4	15.3	202 48.3	47.9	351 53.0	28	24 43.1	+ 36
14	71 55.2	6 57.7	07.4	154 48.6	22.3	346 19.3	15.3	217 50.9	47.8	6 14.8	29	24 46.7	+ 35
15	86 57.6	21 57.0	·· 08.1	169 50.5	·· 22.4	1 21.2	·· 15.3	232 53.6	·· 47.7	20 36.7	29	·24 50.2	+ 32
16	102 00.1	36 56.2	08.7	184 52.4	22.5	16 23.2	15.3	247 56.2	47.7	34 58.6	29	24 53.4	+ 31
17	117 02.6	51 55.5	09.3	199 54.3	22.6	31 25.1	15.4	262 58.9	47.6	49 20.5	29	24 56.5	+ 29
18	132 05.0	66 54.7	+22 09.9	214 56.2	−24 22.7	46 27.0	+23 15.4	278 01.5	−10 47.6	63 42.4	30	+24 59.4	+ 27
19	147 07.5	81 53.9	10.5	229 58.1	22.8	61 29.0	15.4	293 04.2	47.5	78 04.4	29	25 02.1	+ 25
20	162 10.0	96 53.2	11.1	245 00.0	22.9	76 30.9	15.4	308 06.8	47.4	92 26.3	29	25 04.6	+ 24
21	177 12.4	111 52.4	·· 11.7	260 01.9	·· 23.0	91 32.8	·· 15.4	323 09.4	·· 47.4	106 48.2	30	·25 07.0	+ 21
22	192 14.9	126 51.7	12.4	275 03.8	23.1	106 34.7	15.5	338 12.1	47.3	121 10.2	30	25 09.1	+ 20
23	207 17.4	141 50.9	13.0	290 05.7	23.2	121 36.7	15.5	353 14.7	47.3	135 32.2	30	25 11.1	+ 18
5 0	222 19.8	156 50.1	+22 13.6	305 07.6	−24 23.3	136 38.6	+23 15.5	8 17.4	−10 47.2	149 54.2	31	+25 12.9	+ 16
1	237 22.3	171 49.4	14.2	320 09.5	23.4	151 40.5	15.5	23 20.0	47.1	164 16.3	31	25 14.5	+ 14
2	252 24.8	186 48.6	14.8	335 11.4	23.5	166 42.5	15.5	38 22.7	47.1	178 38.4	31	25 15.9	+ 12
3	267 27.2	201 47.8	·· 15.4	350 13.3	·· 23.6	181 44.4	·· 15.6	53 25.3	·· 47.0	193 00.5	31	·25 17.1	+ 10
4	282 29.7	216 47.1	16.0	5 15.2	23.6	196 46.3	15.6	68 28.0	47.0	207 22.6	32	25 18.1	+ 9
5	297 32.1	231 46.3	16.6	20 17.1	23.7	211 48.3	15.6	83 30.6	46.9	221 44.8	32	25 19.0	+ 7
6	312 34.6	246 45.5	+22 17.2	35 19.0	−24 23.8	226 50.2	+23 15.6	98 33.2	−10 46.8	236 07.0	33	+25 19.7	+ 4
7	327 37.1	261 44.8	17.8	50 20.9	23.9	241 52.1	15.6	113 35.9	46.8	250 29.3	33	25 20.1	+ 3
8	342 39.5	276 44.0	18.4	65 22.8	24.0	256 54.0	15.6	128 38.5	46.7	264 51.6	33	25 20.4	+ 2
9	357 42.0	291 43.3	·· 19.0	80 24.7	·· 24.1	271 56.0	·· 15.7	143 41.2	·· 46.7	279 13.9	34	·25 20.6	− 1
10	12 44.5	306 42.5	19.6	95 26.6	24.2	286 57.9	15.7	158 43.8	46.6	293 36.3	35	25 20.5	− 2
11	27 46.9	321 41.7	20.2	110 28.5	24.3	301 59.8	15.7	173 46.5	46.5	307 58.8	35	25 20.3	− 4
12	42 49.4	336 41.0	+22 20.8	125 30.4	−24 24.4	317 01.7	+23 15.7	188 49.1	−10 46.5	322 21.3	36	+25 19.9	− 6
13	57 51.9	351 40.2	21.4	140 32.4	24.5	332 03.7	15.7	203 51.8	46.4	336 43.9	36	25 19.3	− 8
14	72 54.3	6 39.4	22.0	155 34.3	24.6	347 05.6	15.8	218 54.4	46.4	351 06.5	37	25 18.5	− 10
15	87 56.8	21 38.7	·· 22.6	170 36.2	·· 24.7	2 07.5	·· 15.8	233 57.0	·· 46.3	5 29.2	37	·25 17.5	− 11
16	102 59.3	36 37.9	23.2	185 38.1	24.8	17 09.5	15.8	248 59.7	46.3	19 51.9	38	25 16.4	− 13
17	118 01.7	51 37.1	23.8	200 40.0	24.9	32 11.4	15.8	264 02.3	46.2	34 14.7	39	25 15.1	− 15
18	133 04.2	66 36.4	+22 24.4	215 41.9	−24 25.0	47 13.3	+23 15.8	279 05.0	−10 46.1	48 37.6	39	+25 13.6	− 16
19	148 06.6	81 35.6	24.9	230 43.9	25.1	62 15.2	15.9	294 07.6	46.1	63 00.5	40	25 12.0	− 19
20	163 09.1	96 34.8	25.5	245 45.8	25.2	77 17.2	15.9	309 10.3	46.0	77 23.5	41	25 10.1	− 20
21	178 11.6	111 34.0	·· 26.1	260 47.7	·· 25.3	92 19.1	·· 15.9	324 12.9	·· 46.0	91 46.6	42	·25 08.1	− 21
22	193 14.0	126 33.3	26.7	275 49.6	25.4	107 21.0	15.9	339 15.5	45.9	106 09.8	42	25 06.0	− 24
23	208 16.5	141 32.5	27.3	290 51.5	25.5	122 22.9	15.9	354 18.2	45.8	120 33.0	44	25 03.6	− 25
6 0	223 19.0	156 31.7	+22 27.9	305 53.5	−24 25.6	137 24.9	+23 16.0	9 20.8	−10 45.8	134 56.4	44	+25 01.1	− 26
1	238 21.4	171 31.0	28.5	320 55.4	25.7	152 26.8	16.0	24 23.5	45.7	149 19.8	44	24 58.5	− 29
2	253 23.9	186 30.2	29.0	335 57.3	25.8	167 28.7	16.0	39 26.1	45.7	163 43.2	46	24 55.6	− 30
3	268 26.4	201 29.4	·· 29.6	350 59.3	·· 25.9	182 30.6	·· 16.0	54 28.8	·· 45.6	178 06.8	47	·24 52.6	− 32
4	283 28.8	216 28.6	30.2	6 01.2	26.0	197 32.6	16.0	69 31.4	45.5	192 30.5	47	24 49.4	− 33
5	298 31.3	231 27.9	30.8	21 03.1	26.1	212 34.5	16.0	84 34.1	45.5	206 54.2	48	24 46.1	− 35
6	313 33.7	246 27.1	+22 31.3	36 05.0	−24 26.2	227 36.4	+23 16.1	99 36.7	−10 45.4	221 18.0	50	+24 42.6	− 36
7	328 36.2	261 26.3	31.9	51 07.0	26.3	242 38.3	16.1	114 39.3	45.4	235 42.0	50	24 39.0	− 38
8	343 38.7	276 25.5	32.5	66 08.9	26.4	257 40.3	16.1	129 42.0	45.3	250 06.0	51	24 35.2	− 40
9	358 41.1	291 24.8	·· 33.1	81 10.8	·· 26.5	272 42.2	·· 16.1	144 44.6	·· 45.3	264 30.1	52	·24 31.2	− 41
10	13 43.6	306 24.0	33.6	96 12.8	26.6	287 44.1	16.1	159 47.3	45.2	278 54.3	53	24 27.1	− 43
11	28 46.1	321 23.2	34.2	111 14.7	26.7	302 46.0	16.2	174 49.9	45.1	293 18.6	54	24 22.8	− 44
12	43 48.5	336 22.4	+22 34.8	126 16.7	−24 26.8	317 48.0	+23 16.2	189 52.6	−10 45.1	307 43.0	55	+24 18.4	− 46
13	58 51.0	351 21.7	35.4	141 18.6	26.9	332 49.9	16.2	204 55.2	45.0	322 07.5	56	24 13.8	− 47
14	73 53.5	6 20.9	35.9	156 20.5	27.0	347 51.8	16.2	219 57.8	45.0	336 32.1	57	24 09.1	− 49
15	88 55.9	21 20.1	·· 36.5	171 22.5	·· 27.1	2 53.7	·· 16.2	235 00.5	·· 44.9	350 56.8	58	·24 04.2	− 51
16	103 58.4	36 19.3	37.1	186 24.4	27.2	17 55.7	16.3	250 03.1	44.8	5 21.6	59	23 59.1	− 51
17	119 00.9	51 18.6	37.6	201 26.4	27.3	32 57.6	16.3	265 05.8	44.8	19 46.5	60	23 54.0	− 53
18	134 03.3	66 17.8	+22 38.2	216 28.3	−24 27.4	47 59.5	+23 16.3	280 08.4	−10 44.7	34 11.5	61	+23 48.7	− 55
19	149 05.8	81 17.0	38.7	231 30.3	27.5	63 01.4	16.3	295 11.1	44.7	48 36.6	62	23 43.2	− 56
20	164 08.2	96 16.2	39.3	246 32.2	27.6	78 03.4	16.3	310 13.7	44.6	63 01.8	64	23 37.6	− 58
21	179 10.7	111 15.5	·· 39.9	261 34.2	·· 27.7	93 05.3	·· 16.3	325 16.3	·· 44.6	77 27.2	64	·23 31.8	− 58
22	194 13.2	126 14.7	40.4	276 36.1	27.8	108 07.2	16.4	340 19.0	44.5	91 52.6	65	23 26.0	− 60
23	209 15.6	141 13.9	41.0	291 38.1	27.9	123 09.1	16.4	355 21.6	44.4	106 18.1	67	23 20.0	− 62
24	224 18.1	156 13.1	+22 41.5	306 40.0	−24 28.0	138 11.0	+23 16.4	10 24.3	−10 44.4	120 43.8	68	+23 13.8	− 63
code	—	− 8	+ 6	+ 20	− 1	+ 20	0	+ 27	+ 1				

Day	GMT h	SUN GHA ° ′	Dec. ° ′
4	0	180 48.1	+15 44.6
	1	195 48.2	45.4
	2	210 48.3	46.1
	3	225 48.3	·· 46.8
	4	240 48.4	47.6
	5	255 48.4	48.3
	6	270 48.5	+15 49.0
	7	285 48.6	49.7
	8	300 48.6	50.5
	9	315 48.7	·· 51.2
	10	330 48.8	51.9
	11	345 48.8	52.7
	12	0 48.9	+15 53.4
	13	15 48.9	54.1
	14	30 49.0	54.8
	15	45 49.1	·· 55.6
	16	60 49.1	56.3
	17	75 49.2	57.0
	18	90 49.2	+15 57.7
	19	105 49.3	58.5
	20	120 49.3	59.2
	21	135 49.4	·15 59.9
	22	150 49.5	16 00.6
	23	165 49.5	01.4
5	0	180 49.6	+16 02.1
	1	195 49.6	02.8
	2	210 49.7	03.5
	3	225 49.8	·· 04.2
	4	240 49.8	05.0
	5	255 49.9	05.7
	6	270 49.9	+16 06.4
	7	285 50.0	07.1
	8	300 50.0	07.8
	9	315 50.1	·· 08.6
	10	330 50.1	09.3
	11	345 50.2	10.0
	12	0 50.3	+16 10.7
	13	15 50.3	11.4
	14	30 50.4	12.1
	15	45 50.4	·· 12.9
	16	60 50.5	13.6
	17	75 50.5	14.3
	18	90 50.6	+16 15.0
	19	105 50.6	15.7
	20	120 50.7	16.4
	21	135 50.7	·· 17.1
	22	150 50.8	17.9
	23	165 50.8	18.6
6	0	180 50.9	+16 19.3
	1	195 50.9	20.0
	2	210 51.0	20.7
	3	225 51.0	·· 21.4
	4	240 51.1	22.1
	5	255 51.2	22.8
	6	270 51.2	+16 23.5
	7	285 51.3	24.2
	8	300 51.3	24.9
	9	315 51.4	·· 25.7
	10	330 51.4	26.4
	11	345 51.5	27.1
	12	0 51.5	+16 27.8
	13	15 51.6	28.5
	14	30 51.6	29.2
	15	45 51.6	·· 29.9
	16	60 51.7	30.6
	17	75 51.7	31.3
	18	90 51.8	+16 32.0
	19	105 51.8	32.7
	20	120 51.9	33.4
	21	135 51.9	·· 34.1
	22	150 52.0	34.8
	23	165 52.0	35.5
	24	180 52.1	+16 36.2
code		—	+ 7

No.	STARS Name	SHA ° ′	Dec. ° ′
7	Acamar	315 52.3	−40 29.2
5	Achernar	336 00.1	−57 27.9
30	Acrux	173 58.6	−62 51.1
19	Adhara	255 47.6	−28 54.7
10	Aldebaran	291 40.6	+16 25.2
32	Alioth	166 58.9	+56 12.4
34	Alkaid	153 33.2	+49 32.4
55	Al Na'ir	28 39.3	−47 10.7
15	Alnilam	276 31.6	− 1 13.8
25	Alphard	218 39.6	− 8 27.8
41	Alphecca	126 48.1	+26 51.8
1	Alpheratz	358 29.7	+28 50.2
51	Altair	62 51.3	+ 8 44.7
2	Ankaa	353 59.6	−42 33.0
42	Antares	113 20.3	−26 20.1
37	Arcturus	146 35.8	+19 25.0
43	Atria	109 01.6	−68 56.8
22	Avior	234 36.4	−59 22.1
13	Bellatrix	279 19.8	+ 6 18.6
16	Betelg'se	271 49.5	+ 7 24.0
17	Canopus	264 16.2	−52 40.4
12	Capella	281 40.4	+45 57.4
53	Deneb	50 01.7	+45 06.7
28	Denebola	183 18.6	+14 49.5
4	Diphda	349 40.6	−18 14.1
27	Dubhe	194 45.4	+62 00.0
14	Elnath	279 09.0	+28 34.3
47	Eltanin	91 06.3	+51 29.3
54	Enif	34 30.7	+ 9 39.8
56	Fomalhaut	16 12.9	−29 51.7
31	Gacrux	172 50.1	−56 51.8
29	Gienah	176 37.7	−17 17.6
35	Hadar	149 50.4	−60 09.5
6	Hamal	328 51.2	+23 14.8
48	Kaus Aust.	84 42.3	−34 24.5
40	Kochab	137 16.5	+74 20.4
57	Markab	14 22.7	+14 57.5
8	Menkar	315 01.8	+ 3 54.7
36	Menkent	148 59.6	−36 09.0
24	Miapl'dus	221 49.4	−69 32.1
9	Mirfak	309 44.5	+49 42.1
50	Nunki	76 53.0	−26 21.3
52	Peacock	54 28.8	−56 52.8
21	Pollux	244 22.0	+28 08.3
20	Procyon	245 46.2	+ 5 20.5
46	R'alhague	96 47.3	+12 35.3
26	Regulus	208 30.5	+12 11.4
11	Rigel	281 54.9	− 8 15.2
38	Rigil Kent.	140 51.9	−60 39.2
44	Sabik	103 03.1	−15 40.3
3	Schedar	350 31.8	+56 17.1
45	Shaula	97 21.8	−37 04.4
18	Sirius	259 13.0	−16 39.3
33	Spica	159 17.7	−10 55.6
23	Suhail	223 25.2	−43 15.2
49	Vega	81 08.7	+38 44.1
39	Zub'g'bi	137 54.2	−15 51.4

Lat. °	Sunrise h m	Twlt. begins h m	Moonrise 4 h m	5 h m	6 h m	7 h m
N 72	1 19	////	□	□	□	□
70	2 10	////	□	□	□	□
68	2 41	////	□	□	□	□
66	3 04	////	1 45	□	□	5 36
64	3 22	////	2 49	3 13	4 31	6 21
62	3 36	////	3 24	4 03	5 15	6 50
60	3 49	////	3 50	4 35	5 45	7 13
58	3 59	////	4 10	4 58	6 07	7 31
56	4 08	////	4 27	5 18	6 26	7 46
54	4 17	1 16	4 41	5 34	6 41	7 59
52	4 24	1 47	4 54	5 47	6 55	8 10
50	4 30	2 08	5 05	6 00	7 06	8 20
45	4 44	2 46	5 28	6 25	7 30	8 41
40	4 56	3 12	5 47	6 45	7 50	8 58
35	5 06	3 32	6 02	7 02	8 06	9 12
30	5 14	3 47	6 16	7 16	8 20	9 25
20	5 29	4 11	6 39	7 41	8 44	9 46
10	5 41	4 29	7 00	8 02	9 04	10 04
0	5 53	4 42	7 19	8 22	9 24	10 21
10	6 05	4 53	7 38	8 42	9 43	10 38
20	6 17	5 02	7 59	9 04	10 03	10 56
30	6 31	5 09	8 22	9 29	10 27	11 17
35	6 39	5 12	8 36	9 43	10 41	11 29
40	6 48	5 15	8 53	10 00	10 57	11 43
45	6 59	5 18	9 12	10 21	11 16	11 59
50	7 12	5 20	9 37	10 46	11 40	12 20
52	7 18	5 20	9 49	10 59	11 51	12 29
54	7 24	5 21	10 02	11 13	12 04	12 40
56	7 32	5 22	10 18	11 29	12 19	12 52
58	7 40	5 22	10 37	11 49	12 37	13 06
60 S	7 49	5 22	11 00	12 14	12 58	13 22

Lat. °	Sunset h m	Twlt. ends h m	Moonset 4 h m	5 h m	6 h m	7 h m
N 72	22 45	////	□	□	□	□
70	21 49	////	□	□	□	□
68	21 16	////	□	□	□	□
66	20 53	////	0 11	□	□	2 46
64	20 34	////	24 58	0 58	1 50	2 01
62	20 19	////	24 07	0 07	1 05	1 31
60	20 07	////	23 35	24 35	0 35	1 08
58	19 56	////	23 12	24 12	0 12	0 50
56	19 46	////	22 52	23 53	24 34	0 34
54	19 38	22 45	22 36	23 38	24 21	0 21
52	19 31	22 12	22 23	23 24	24 09	0 09
50	19 24	21 50	22 11	23 12	23 59	24 33
45	19 10	21 11	21 46	22 48	23 37	24 15
40	18 58	20 44	21 26	22 28	23 19	24 01
35	18 48	20 23	21 09	22 11	23 04	23 48
30	18 40	20 08	20 54	21 57	22 51	23 37
20	18 25	19 44	20 30	21 33	22 29	23 19
10	18 12	19 26	20 09	21 12	22 10	23 02
0	18 00	19 12	19 49	20 52	21 52	22 47
10	17 48	19 00	19 29	20 32	21 33	22 31
20	17 36	18 51	19 08	20 11	21 14	22 14
30	17 22	18 44	18 44	19 46	20 51	21 55
35	17 14	18 40	18 29	19 31	20 37	21 44
40	17 05	18 37	18 13	19 15	20 22	21 31
45	16 54	18 34	17 53	18 54	20 03	21 15
50	16 41	18 32	17 28	18 29	19 40	20 56
52	16 35	18 31	17 16	18 16	19 29	20 47
54	16 28	18 30	17 02	18 02	19 16	20 36
56	16 21	18 29	16 46	17 46	19 02	20 25
58	16 13	18 29	16 27	17 26	18 44	20 11
60 S	16 03	18 28	16 04	17 01	18 23	19 56

G M T h	Equation of Time (App.—Mean) 4 m s	5 m s	6 m s
0	+ 3 12.4	+ 3 18.2	+ 3 23.5
6	+ 3 13.9	+ 3 19.6	+ 3 24.7
12	+ 3 15.4	+ 3 20.9	+ 3 25.9
18	+ 3 16.8	+ 3 22.2	+ 3 27.1
24	+ 3 18.2	+ 3 23.5	+ 3 28.2

GMT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
4	13 34	13 32	3 42	14 55	23 27
5	14 37	13 33	3 39	14 52	23 23
6	15 38	13 35	3 36	14 48	23 19
7	16 34	13 36	3 33	14 45	23 14

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0			
	0.2	0.1	0.2
30			
	0.2	0.1	0.2
45			
	0.2	0.1	0.1
60			
	0.2	0.0	0.1
75			
	0.2	0.0	0.0
90			

Moon's Lower Limb Add

Alt. °	4 ′	5 ′	6 ′
0			
	20.0	19.1	17.8
4			
	20.0	19.1	17.8
8			
	20.0	19.1	17.8
12			
	19.9	19.0	17.8
16			
	19.8	19.0	17.8
20			
	19.8	18.9	17.7
24			
	19.6	18.8	17.7
28			
	19.5	18.7	17.6
32			
	19.4	18.6	17.5
36			
	19.3	18.5	17.5
40			
	19.1	18.4	17.4
44			
	18.9	18.3	17.3
48			
	18.8	18.1	17.2
52			
	18.6	18.0	17.1
56			
	18.4	17.8	17.0
60			
	18.1	17.6	16.9
64			
	17.9	17.5	16.8
68			
	17.7	17.3	16.7
72			
	17.5	17.1	16.5
76			
	17.2	16.9	16.4
80			
	17.0	16.7	16.3
84			
	16.7	16.5	16.2
88			
	16.6	16.4	16.1
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt. °	4 ′	5 ′	6 ′
0			
	13.0	13.5	14.2
4			
	13.0	13.5	14.3
8			
	13.1	13.6	14.3
12			
	13.1	13.6	14.3
16			
	13.2	13.6	14.3
20			
	13.3	13.7	14.4
24			
	13.4	13.8	14.4
28			
	13.5	13.9	14.5
32			
	13.6	14.0	14.5
36			
	13.7	14.1	14.6
40			
	13.9	14.2	14.7
44			
	14.1	14.4	14.8
48			
	14.3	14.5	14.9
52			
	14.4	14.7	15.0
56			
	14.6	14.8	15.1
60			
	14.9	15.0	15.2
64			
	15.1	15.2	15.3
68			
	15.3	15.4	15.4
72			
	15.5	15.5	15.5
76			
	15.8	15.7	15.7
80			
	16.0	15.9	15.8
84			
	16.3	16.1	15.9
88			
	16.4	16.3	16.0
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −3.3 GHA	VENUS Dec.	MARS −0.9 GHA	MARS Dec.	JUPITER −1.5 GHA	JUPITER Dec.	SATURN 0.4 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
7 0	224 18.1	156 13.1	+22 41.5	306 40.0	−24 28.0	138 11.0	+23 16.4	10 24.3	−10 44.4	120 43.8	68	+23 13.8	−63
1	239 20.6	171 12.3	42.1	321 42.0	28.1	153 13.0	16.4	25 26.9	44.3	135 09.6	68	23 07.5	−64
2	254 23.0	186 11.6	42.7	336 43.9	28.2	168 14.9	16.4	40 29.6	44.3	149 35.4	70	23 01.1	−65
3	269 25.5	201 10.8	·· 43.2	351 45.9	·· 28.3	183 16.8	·· 16.5	55 32.2	·· 44.2	164 01.4	71	·22 54.6	−67
4	284 28.0	216 10.0	43.8	6 47.8	28.4	198 18.7	16.5	70 34.8	44.1	178 27.5	72	22 47.9	−68
5	299 30.4	231 09.2	44.3	21 49.8	28.5	213 20.7	16.5	85 37.5	44.1	192 53.7	74	22 41.1	−70
6	314 32.9	246 08.4	+22 44.9	36 51.7	−24 28.6	228 22.6	+23 16.5	100 40.1	−10 44.0	207 20.1	74	+22 34.1	−70
7	329 35.4	261 07.6	45.4	51 53.7	28.7	243 24.5	16.5	115 42.8	44.0	221 46.5	75	22 27.1	−72
8	344 37.8	276 06.9	46.0	66 55.7	28.8	258 26.4	16.5	130 45.4	43.9	236 13.0	77	22 19.9	−73
9	359 40.3	291 06.1	·· 46.5	81 57.6	·· 28.9	273 28.3	·· 16.6	145 48.1	·· 43.9	250 39.7	78	·22 12.6	−74
10	14 42.7	306 05.3	47.1	96 59.6	29.0	288 30.3	16.6	160 50.7	43.8	265 06.5	79	22 05.2	−75
11	29 45.2	321 04.5	47.6	112 01.5	29.1	303 32.2	16.6	175 53.3	43.7	279 33.4	80	21 57.7	−77
12	44 47.7	336 03.7	+22 48.1	127 03.5	−24 29.2	318 34.1	+23 16.6	190 56.0	−10 43.7	294 00.4	81	+21 50.0	−78
13	59 50.1	351 02.9	48.7	142 05.5	29.3	333 36.0	16.6	205 58.6	43.6	308 27.5	83	21 42.2	−78
14	74 52.6	6 02.2	49.2	157 07.4	29.4	348 38.0	16.6	221 01.3	43.6	322 54.8	83	21 34.4	−80
15	89 55.1	21 01.4	·· 49.8	172 09.4	·· 29.5	3 39.9	·· 16.7	236 03.9	·· 43.5	337 22.1	85	·21 26.4	−81
16	104 57.5	36 00.6	50.3	187 11.4	29.6	18 41.8	16.7	251 06.6	43.4	351 49.6	86	21 18.3	−83
17	120 00.0	50 59.8	50.8	202 13.3	29.7	33 43.7	16.7	266 09.2	43.4	6 17.2	87	21 10.0	−83
18	135 02.5	65 59.0	+22 51.4	217 15.3	−24 29.8	48 45.6	+23 16.7	281 11.8	−10 43.3	20 44.9	88	+21 01.7	−84
19	150 04.9	80 58.2	51.9	232 17.3	29.9	63 47.6	16.7	296 14.5	43.3	35 12.7	89	20 53.3	−85
20	165 07.4	95 57.4	52.5	247 19.3	30.0	78 49.5	16.8	311 17.1	43.2	49 40.6	90	20 44.8	−87
21	180 09.9	110 56.7	·· 53.0	262 21.2	·· 30.1	93 51.4	·· 16.8	326 19.8	·· 43.2	64 08.6	92	·20 36.1	−87
22	195 12.3	125 55.9	53.5	277 23.2	30.2	108 53.3	16.8	341 22.4	43.1	78 36.8	93	20 27.4	−88
23	210 14.8	140 55.1	54.1	292 25.2	30.3	123 55.2	16.8	356 25.0	43.0	93 05.1	93	20 18.6	−89
8 0	225 17.2	155 54.3	+22 54.6	307 27.2	−24 30.5	138 57.2	+23 16.8	11 27.7	−10 43.0	107 33.4	95	+20 09.7	−91
1	240 19.7	170 53.5	55.1	322 29.1	30.6	153 59.1	16.8	26 30.3	42.9	122 01.9	96	20 00.6	−91
2	255 22.2	185 52.7	55.6	337 31.1	30.7	169 01.0	16.9	41 33.0	42.9	136 30.5	98	19 51.5	−92
3	270 24.6	200 51.9	·· 56.2	352 33.1	·· 30.8	184 02.9	·· 16.9	56 35.6	·· 42.8	150 59.3	98	·19 42.3	−93
4	285 27.1	215 51.1	56.7	7 35.1	30.9	199 04.8	16.9	71 38.3	42.8	165 28.1	99	19 33.0	−94
5	300 29.6	230 50.3	57.2	22 37.1	31.0	214 06.7	16.9	86 40.9	42.7	179 57.0	101	19 23.6	−95
6	315 32.0	245 49.5	+22 57.7	37 39.1	−24 31.1	229 08.7	+23 16.9	101 43.5	−10 42.6	194 26.1	102	+19 14.1	−96
7	330 34.5	260 48.8	58.3	52 41.0	31.2	244 10.6	16.9	116 46.2	42.6	208 55.3	102	19 04.5	−96
8	345 37.0	275 48.0	58.8	67 43.0	31.3	259 12.5	17.0	131 48.8	42.5	223 24.5	104	18 54.9	−98
9	0 39.4	290 47.2	·· 59.3	82 45.0	·· 31.4	274 14.4	·· 17.0	146 51.5	·· 42.5	237 53.9	105	·18 45.1	−98
10	15 41.9	305 46.4	22 59.8	97 47.0	31.5	289 16.3	17.0	161 54.1	42.4	252 23.4	106	18 35.3	−99
11	30 44.4	320 45.6	23 00.3	112 49.0	31.6	304 18.3	17.0	176 56.7	42.4	266 53.0	107	18 25.4	−100
12	45 46.8	335 44.8	+23 00.9	127 51.0	−24 31.7	319 20.2	+23 17.0	191 59.4	−10 42.3	281 22.7	109	+18 15.4	−101
13	60 49.3	350 44.0	01.4	142 53.0	31.8	334 22.1	17.0	207 02.0	42.2	295 52.6	109	18 05.3	−101
14	75 51.7	5 43.2	01.9	157 55.0	31.9	349 24.0	17.1	222 04.7	42.2	310 22.5	110	17 55.2	−102
15	90 54.2	20 42.4	·· 02.4	172 57.0	·· 32.0	4 25.9	·· 17.1	237 07.3	·· 42.1	324 52.5	112	·17 45.0	−103
16	105 56.7	35 41.6	02.9	187 59.0	32.1	19 27.9	17.1	252 10.0	42.1	339 22.7	112	17 34.7	−104
17	120 59.1	50 40.8	03.4	203 01.0	32.2	34 29.8	17.1	267 12.6	42.0	353 52.9	113	17 24.3	−104
18	136 01.6	65 40.0	+23 03.9	218 03.0	−24 32.3	49 31.7	+23 17.1	282 15.2	−10 42.0	8 23.2	115	+17 13.9	−106
19	151 04.1	80 39.2	04.5	233 05.0	32.5	64 33.6	17.1	297 17.9	41.9	22 53.7	115	17 03.3	−105
20	166 06.5	95 38.4	05.0	248 07.0	32.6	79 35.5	17.2	312 20.5	41.8	37 24.2	117	16 52.8	−107
21	181 09.0	110 37.6	·· 05.5	263 09.0	·· 32.7	94 37.4	·· 17.2	327 23.2	·· 41.8	51 54.9	117	·16 42.1	−107
22	196 11.5	125 36.9	06.0	278 11.0	32.8	109 39.4	17.2	342 25.8	41.7	66 25.6	119	16 31.4	−108
23	211 13.9	140 36.1	06.5	293 13.0	32.9	124 41.3	17.2	357 28.4	41.7	80 56.5	119	16 20.6	−108
9 0	226 16.4	155 35.3	+23 07.0	308 15.0	−24 33.0	139 43.2	+23 17.2	12 31.1	−10 41.6	95 27.4	121	+16 09.8	−110
1	241 18.8	170 34.5	07.5	323 17.0	33.1	154 45.1	17.2	27 33.7	41.5	109 58.5	121	15 58.8	−109
2	256 21.3	185 33.7	08.0	338 19.0	33.2	169 47.0	17.3	42 36.4	41.5	124 29.6	122	15 47.9	−111
3	271 23.8	200 32.9	·· 08.5	353 21.0	·· 33.3	184 48.9	·· 17.3	57 39.0	·· 41.4	139 00.8	124	·15 36.8	−111
4	286 26.2	215 32.1	09.0	8 23.0	33.4	199 50.9	17.3	72 41.6	41.4	153 32.2	124	15 25.7	−111
5	301 28.7	230 31.3	09.5	23 25.0	33.5	214 52.8	17.3	87 44.3	41.3	168 03.6	125	15 14.6	−112
6	316 31.2	245 30.5	+23 10.0	38 27.0	−24 33.6	229 54.7	+23 17.3	102 46.9	−10 41.3	182 35.1	126	+15 03.4	−113
7	331 33.6	260 29.7	10.5	53 29.0	33.7	244 56.6	17.3	117 49.6	41.2	197 06.7	127	14 52.1	−113
8	346 36.1	275 28.9	11.0	68 31.1	33.8	259 58.5	17.4	132 52.2	41.1	211 38.4	128	14 40.8	−114
9	1 38.6	290 28.1	·· 11.5	83 33.1	·· 34.0	275 00.4	·· 17.4	147 54.8	·· 41.1	226 10.2	129	·14 29.4	−114
10	16 41.0	305 27.3	12.0	98 35.1	34.1	290 02.3	17.4	162 57.5	41.0	240 42.1	130	14 18.0	−115
11	31 43.5	320 26.5	12.5	113 37.1	34.2	305 04.3	17.4	178 00.1	41.0	255 14.1	131	14 06.5	−115
12	46 46.0	335 25.7	+23 12.9	128 39.1	−24 34.3	320 06.2	+23 17.4	193 02.8	−10 40.9	269 46.2	131	+13 55.0	−116
13	61 48.4	350 24.9	13.4	143 41.1	34.4	335 08.1	17.4	208 05.4	40.9	284 18.3	132	13 43.4	−116
14	76 50.9	5 24.1	13.9	158 43.2	34.5	350 10.0	17.5	223 08.1	40.8	298 50.5	133	13 31.8	−117
15	91 53.3	20 23.3	·· 14.4	173 45.2	·· 34.6	5 11.9	·· 17.5	238 10.7	·· 40.8	313 22.8	134	·13 20.1	−117
16	106 55.8	35 22.5	14.9	188 47.2	34.7	20 13.8	17.5	253 13.3	40.7	327 55.2	135	13 08.4	−118
17	121 58.3	50 21.7	15.4	203 49.2	34.8	35 15.8	17.5	268 16.0	40.6	342 27.7	136	12 56.6	−118
18	137 00.7	65 20.9	+23 15.9	218 51.3	−24 34.9	50 17.7	+23 17.5	283 18.6	−10 40.6	357 00.3	136	+12 44.8	−118
19	152 03.2	80 20.1	16.3	233 53.3	35.0	65 19.6	17.5	298 21.2	40.5	11 32.9	137	12 33.0	−119
20	167 05.7	95 19.3	16.8	248 55.3	35.2	80 21.5	17.6	313 23.9	40.5	26 05.6	138	12 21.1	−120
21	182 08.1	110 18.5	·· 17.3	263 57.3	·· 35.3	95 23.4	·· 17.6	328 26.5	·· 40.4	40 38.4	139	·12 09.1	−119
22	197 10.6	125 17.6	17.8	278 59.4	35.4	110 25.3	17.6	343 29.2	40.4	55 11.3	139	11 57.2	−120
23	212 13.1	140 16.8	18.3	294 01.4	35.5	125 27.2	17.6	358 31.8	40.3	69 44.2	141	11 45.2	−121
24	227 15.5	155 16.0	+23 18.7	309 03.4	−24 35.6	140 29.2	+23 17.6	13 34.4	−10 40.2	84 17.3	141	+11 33.1	−121
code	—	−8	+5	+20	−1	+19	0	+26	+1				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
7 0	180 52.1	+16 36.2
1	195 52.1	36.9
2	210 52.2	37.6
3	225 52.2 ••	38.3
4	240 52.3	39.0
5	255 52.3	39.7
6	270 52.3	+16 40.4
7	285 52.4	41.1
8	300 52.4	41.8
9	315 52.5 ••	42.5
10	330 52.5	43.2
11	345 52.6	43.9
12	0 52.6	+16 44.5
13	15 52.7	45.2
14	30 52.7	45.9
15	45 52.7 ••	46.6
16	60 52.8	47.3
17	75 52.8	48.0
18	90 52.9	+16 48.7
19	105 52.9	49.4
20	120 52.9	50.1
21	135 53.0 ••	50.8
22	150 53.0	51.5
23	165 53.1	52.1
8 0	180 53.1	+16 52.8
1	195 53.2	53.5
2	210 53.2	54.2
3	225 53.2 ••	54.9
4	240 53.3	55.6
5	255 53.3	56.3
6	270 53.4	+16 56.9
7	285 53.4	57.6
8	300 53.4	58.3
9	315 53.5 ••	59.0
10	330 53.5	16 59.7
11	345 53.5	17 00.4
12	0 53.6	+17 01.0
13	15 53.6	01.7
14	30 53.7	02.4
15	45 53.7 ••	03.1
16	60 53.7	03.8
17	75 53.8	04.4
18	90 53.8	+17 05.1
19	105 53.8	05.8
20	120 53.9	06.5
21	135 53.9 ••	07.2
22	150 53.9	07.8
23	165 54.0	08.5
9 0	180 54.0	+17 09.2
1	195 54.0	09.9
2	210 54.1	10.5
3	225 54.1 ••	11.2
4	240 54.2	11.9
5	255 54.2	12.6
6	270 54.2	+17 13.2
7	285 54.3	13.9
8	300 54.3	14.6
9	315 54.3 ••	15.3
10	330 54.4	15.9
11	345 54.4	16.6
12	0 54.4	+17 17.3
13	15 54.4	17.9
14	30 54.5	18.6
15	45 54.5 ••	19.3
16	60 54.5	19.9
17	75 54.6	20.6
18	90 54.6	+17 21.3
19	105 54.6	21.9
20	120 54.7	22.6
21	135 54.7 ••	23.3
22	150 54.7	23.9
23	165 54.8	24.6
24	180 54.8	+17 25.3
code	—	+ 7

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 52.3	−40 29.1
5	Achernar	336 00.1	−57 27.9
30	Acrux	173 58.6	−62 51.1
19	Adhara	255 47.6	−28 54.7
10	Aldebaran	291 40.6	+16 25.2
32	Alioth	166 58.9	+56 12.4
34	Alkaid	153 33.2	+49 32.4
55	Al Na'ir	28 39.3	−47 10.7
15	Alnilam	276 31.6	− 1 13.8
25	Alphard	218 39.6	− 8 27.8
41	Alphecca	126 48.1	+26 51.9
1	Alpheratz	358 29.7	+28 50.2
51	Altair	62 51.3	+ 8 44.7
2	Ankaa	353 59.6	−42 33.0
42	Antares	113 20.3	−26 20.1
37	Arcturus	146 35.8	+19 25.0
43	Atria	109 01.5	−68 56.8
22	Avior	234 36.4	−59 22.1
13	Bellatrix	279 19.8	+ 6 18.6
16	Betelg'se	271 49.5	+ 7 24.0
17	Canopus	264 16.2	−52 40.4
12	Capella	281 40.4	+45 57.3
53	Deneb	50 01.7	+45 06.7
28	Denebola	183 18.6	+14 49.5
4	Diphda	349 40.5	−18 14.1
27	Dubhe	194 45.4	+62 00.0
14	Elnath	279 09.0	+28 34.3
47	Eltanin	91 06.3	+51 29.4
54	Enif	34 30.7	+ 9 39.8
56	Fomalhaut	16 12.9	−29 51.7
31	Gacrux	172 50.1	−56 51.8
29	Gienah	176 37.7	−17 17.6
35	Hadar	149 50.4	−60 09.5
6	Hamal	328 51.2	+23 14.8
48	Kaus Aust.	84 42.3	−34 24.5
40	Kochab	137 16.5	+74 20.4
57	Markab	14 22.7	+14 57.5
8	Menkar	315 01.7	+ 3 54.7
36	Menkent	148 59.6	−36 09.0
24	Miapl'dus	221 49.4	−69 32.1
9	Mirfak	309 44.4	+49 42.1
50	Nunki	76 53.0	−26 21.3
52	Peacock	54 28.7	−56 52.8
21	Pollux	244 22.0	+28 08.3
20	Procyon	245 46.2	+ 5 20.5
46	R'alhague	96 47.3	+12 35.3
26	Regulus	208 30.6	+12 11.4
11	Rigel	281 54.9	− 8 15.2
38	Rigil Kent.	140 51.9	−60 39.2
44	Sabik	103 03.1	−15 40.3
3	Schedar	350 31.7	+56 17.1
45	Shaula	97 21.8	−37 04.4
18	Sirius	259 13.0	−16 39.2
33	Spica	159 17.7	−10 55.6
23	Suhail	223 25.2	−43 15.2
49	Vega	81 08.7	+38 44.2
39	Zub'g'bi	137 54.2	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 7	Moonrise 8	Moonrise 9	Moonrise 10
°	h m	h m	h m	h m	h m	h m
N 72	0 37	////	▭	▭	8 24	10 41
70	1 50	////	▭	6 15	8 56	10 56
68	2 26	////	▭	7 13	9 19	11 08
66	2 52	////	5 36	7 46	9 38	11 18
64	3 12	////	6 21	8 10	9 52	11 26
62	3 27	////	6 50	8 29	10 04	11 33
60	3 41	////	7 13	8 45	10 14	11 39
58	3 52	////	7 31	8 58	10 23	11 45
56	4 02	////	7 46	9 09	10 31	11 49
54	4 11	0 57	7 59	9 19	10 38	11 54
52	4 18	1 34	8 10	9 28	10 44	11 57
50	4 25	1 58	8 20	9 36	10 50	12 01
45	4 40	2 40	8 41	9 52	11 02	12 08
40	4 52	3 08	8 58	10 06	11 11	12 14
35	5 03	3 28	9 12	10 17	11 20	12 20
30	5 12	3 44	9 25	10 27	11 27	12 24
20	5 27	4 09	9 46	10 45	11 40	12 32
10	5 41	4 27	10 04	11 00	11 51	12 39
0	5 53	4 41	10 21	11 13	12 01	12 46
10	6 05	4 53	10 38	11 27	12 12	12 52
20	6 18	5 03	10 56	11 42	12 23	12 59
30	6 33	5 10	11 17	11 59	12 35	13 07
35	6 42	5 14	11 29	12 09	12 42	13 12
40	6 51	5 17	11 43	12 20	12 51	13 17
45	7 02	5 20	11 59	12 33	13 00	13 23
50	7 16	5 24	12 20	12 49	13 11	13 30
52	7 22	5 25	12 29	12 56	13 17	13 33
54	7 29	5 26	12 40	13 04	13 23	13 37
56	7 37	5 26	12 52	13 14	13 29	13 41
58	7 46	5 27	13 06	13 24	13 36	13 45
S 60	7 56	5 28	13 22	13 36	13 44	13 50

Lat.	Sunset	Twlt. ends	Moonset 7	Moonset 8	Moonset 9	Moonset 10
°	h m	h m	h m	h m	h m	h m
N 72	▭	▭	▭	▭	3 37	2 53
70	22 09	////	▭	4 00	3 02	2 35
68	21 31	////	▭	3 03	2 38	2 22
66	21 04	////	2 46	2 28	2 18	2 10
64	20 44	////	2 01	2 03	2 02	2 01
62	20 28	////	1 31	1 43	1 49	1 52
60	20 14	////	1 08	1 27	1 38	1 45
58	20 02	////	0 50	1 13	1 28	1 39
56	19 52	////	0 34	1 01	1 20	1 33
54	19 43	23 06	0 21	0 51	1 12	1 28
52	19 36	22 25	0 09	0 42	1 05	1 24
50	19 28	21 58	24 33	0 33	0 59	1 20
45	19 13	21 16	24 15	0 15	0 46	1 10
40	19 01	20 48	24 01	0 01	0 35	1 03
35	18 51	20 27	23 48	24 25	0 25	0 56
30	18 42	20 11	23 37	24 17	0 17	0 51
20	18 26	19 45	23 19	24 02	0 02	0 41
10	18 12	19 26	23 02	23 49	24 32	0 32
0	18 00	19 12	22 47	23 37	24 23	0 23
10	17 48	19 01	22 31	23 25	24 15	0 15
20	17 35	18 51	22 14	23 12	24 06	0 06
30	17 20	18 42	21 55	22 57	23 55	24 51
35	17 11	18 38	21 44	22 48	23 49	24 48
40	17 02	18 35	21 31	22 38	23 42	24 44
45	16 50	18 31	21 15	22 26	23 34	24 39
50	16 37	18 28	20 56	22 11	23 24	24 34
52	16 30	18 27	20 47	22 04	23 19	24 32
54	16 23	18 26	20 36	21 57	23 14	24 29
56	16 15	18 24	20 25	21 48	23 09	24 26
58	16 06	18 23	20 11	21 39	23 02	24 22
S 60	15 56	18 23	19 56	21 27	22 55	24 19

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.2	0.1	0.2
30	0.2	0.1	0.2
45	0.2	0.1	0.1
60	0.2	0.0	0.1
75	0.2	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	7	8	9
°	′	′	′
0	16.7	15.6	14.4
4	16.7	15.6	14.4
8	16.7	15.6	14.4
12	16.7	15.6	14.4
16	16.7	15.6	14.4
20	16.6	15.6	14.5
24	16.6	15.6	14.5
28	16.6	15.6	14.5
32	16.5	15.6	14.6
36	16.5	15.6	14.6
40	16.5	15.6	14.6
44	16.4	15.6	14.7
48	16.4	15.6	14.7
52	16.3	15.6	14.8
56	16.3	15.6	14.8
60	16.2	15.6	14.9
64	16.2	15.6	14.9
68	16.1	15.6	15.0
72	16.0	15.6	15.1
76	16.0	15.6	15.1
80	15.9	15.6	15.2
84	15.9	15.6	15.2
88	15.8	15.6	15.3
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	7	8	9
°	′	′	′
0	14.9	15.6	16.2
4	14.9	15.6	16.2
8	14.9	15.6	16.2
12	14.9	15.6	16.2
16	14.9	15.6	16.2
20	15.0	15.6	16.1
24	15.0	15.6	16.1
28	15.0	15.6	16.1
32	15.0	15.6	16.1
36	15.1	15.6	16.0
40	15.1	15.6	16.0
44	15.2	15.6	15.9
48	15.2	15.6	15.9
52	15.3	15.6	15.8
56	15.3	15.6	15.8
60	15.4	15.6	15.7
64	15.4	15.6	15.7
68	15.5	15.6	15.6
72	15.5	15.6	15.6
76	15.6	15.6	15.5
80	15.7	15.6	15.4
84	15.7	15.6	15.4
88	15.8	15.6	15.3
90			

Subtract from table, back cover

Equation of Time (App.—Mean)

GMT	7	8	9
h	m s	m s	m s
0	+ 3 28.2	+ 3 32.4	+ 3 36.0
6	+ 3 29.3	+ 3 33.3	+ 3 36.8
12	+ 3 30.4	+ 3 34.2	+ 3 37.6
18	+ 3 31.4	+ 3 35.1	+ 3 38.3
24	+ 3 32.4	+ 3 36.0	+ 3 39.1

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
7	16 34	13 36	3 33	14 45	23 14
8	17 25	13 37	3 30	14 42	23 10
9	18 12	13 38	3 27	14 39	23 06
10	18 56	13 40	3 23	14 36	23 02

First Quarter 9

GMT		♈ GHA	VENUS −3.3 GHA	VENUS Dec.	MARS −1.0 GHA	MARS Dec.	JUPITER −1.5 GHA	JUPITER Dec.	SATURN 0.4 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
10	0	227 15.5	155 16.0	+23 18.7	309 03.4	−24 35.6	140 29.2	+23 17.6	13 34.4	−10 40.2	84 17.3	141	+11 33.1	−121
	1	242 18.0	170 15.2	19.2	324 05.5	35.7	155 31.1	17.6	28 37.1	40.2	98 50.4	141	11 21.0	−121
	2	257 20.5	185 14.4	19.7	339 07.5	35.8	170 33.0	17.7	43 39.7	40.1	113 23.5	143	11 08.9	−122
	3	272 22.9	200 13.6	•• 20.2	354 09.5	•• 35.9	185 34.9	•• 17.7	58 42.4	•• 40.1	127 56.8	143	• 10 56.7	−121
	4	287 25.4	215 12.8	20.6	9 11.6	36.0	200 36.8	17.7	73 45.0	40.0	142 30.1	144	10 44.6	−123
	5	302 27.8	230 12.0	21.1	24 13.6	36.1	215 38.7	17.7	88 47.6	40.0	157 03.5	144	10 32.3	−122
	6	317 30.3	245 11.2	+23 21.6	39 15.7	−24 36.3	230 40.6	+23 17.7	103 50.3	−10 39.9	171 36.9	145	+10 20.1	−123
	7	332 32.8	260 10.4	22.0	54 17.7	36.4	245 42.5	17.7	118 52.9	39.8	186 10.4	146	10 07.8	−123
	8	347 35.2	275 09.6	22.5	69 19.7	36.5	260 44.5	17.8	133 55.6	39.8	200 44.0	146	9 55.5	−124
	9	2 37.7	290 08.8	•• 23.0	84 21.8	•• 36.6	275 46.4	•• 17.8	148 58.2	•• 39.7	215 17.6	148	• 9 43.1	−123
	10	17 40.2	305 08.0	23.4	99 23.8	36.7	290 48.3	17.8	164 00.8	39.7	229 51.4	147	9 30.8	−124
	11	32 42.6	320 07.2	23.9	114 25.9	36.8	305 50.2	17.8	179 03.5	39.6	244 25.1	149	9 18.4	−124
	12	47 45.1	335 06.4	+23 24.4	129 27.9	−24 36.9	320 52.1	+23 17.8	194 06.1	−10 39.6	258 59.0	148	+ 9 06.0	−125
	13	62 47.6	350 05.6	24.8	144 30.0	37.0	335 54.0	17.8	209 08.8	39.5	273 32.8	150	8 53.5	−125
	14	77 50.0	5 04.7	25.3	159 32.0	37.1	350 55.9	17.8	224 11.4	39.4	288 06.8	150	8 41.0	−125
	15	92 52.5	20 03.9	•• 25.7	174 34.1	•• 37.3	5 57.8	•• 17.9	239 14.0	•• 39.4	302 40.8	151	• 8 28.5	−125
	16	107 54.9	35 03.1	26.2	189 36.1	37.4	20 59.8	17.9	254 16.7	39.3	317 14.9	151	8 16.0	−125
	17	122 57.4	50 02.3	26.7	204 38.2	37.5	36 01.7	17.9	269 19.3	39.3	331 49.0	152	8 03.5	−126
	18	137 59.9	65 01.5	+23 27.1	219 40.2	−24 37.6	51 03.6	+23 17.9	284 22.0	−10 39.2	346 23.2	152	+ 7 50.9	−126
	19	153 02.3	80 00.7	27.6	234 42.3	37.7	66 05.5	17.9	299 24.6	39.2	0 57.4	153	7 38.3	−126
	20	168 04.8	94 59.9	28.0	249 44.3	37.8	81 07.4	17.9	314 27.2	39.1	15 31.7	153	7 25.7	−126
	21	183 07.3	109 59.1	•• 28.5	264 46.4	•• 37.9	96 09.3	•• 18.0	329 29.9	•• 39.1	30 06.0	154	• 7 13.1	−126
	22	198 09.7	124 58.3	28.9	279 48.4	38.0	111 11.2	18.0	344 32.5	39.0	44 40.4	154	7 00.5	−127
	23	213 12.2	139 57.5	29.4	294 50.5	38.2	126 13.1	18.0	359 35.1	38.9	59 14.8	155	6 47.8	−127
11	0	228 14.7	154 56.6	+23 29.8	309 52.6	−24 38.3	141 15.1	+23 18.0	14 37.8	−10 38.9	73 49.3	155	+ 6 35.1	−126
	1	243 17.1	169 55.8	30.3	324 54.6	38.4	156 17.0	18.0	29 40.4	38.8	88 23.8	156	6 22.5	−127
	2	258 19.6	184 55.0	30.7	339 56.7	38.5	171 18.9	18.0	44 43.1	38.8	102 58.4	156	6 09.8	−128
	3	273 22.1	199 54.2	•• 31.2	354 58.7	•• 38.6	186 20.8	•• 18.0	59 45.7	•• 38.7	117 33.0	157	• 5 57.0	−127
	4	288 24.5	214 53.4	31.6	10 00.8	38.7	201 22.7	18.1	74 48.3	38.7	132 07.7	157	5 44.3	−127
	5	303 27.0	229 52.6	32.1	25 02.9	38.8	216 24.6	18.1	89 51.0	38.6	146 42.4	157	5 31.6	−128
	6	318 29.4	244 51.8	+23 32.5	40 04.9	−24 39.0	231 26.5	+23 18.1	104 53.6	−10 38.5	161 17.1	158	+ 5 18.8	−127
	7	333 31.9	259 51.0	32.9	55 07.0	39.1	246 28.4	18.1	119 56.2	38.5	175 51.9	158	5 06.1	−128
	8	348 34.4	274 50.1	33.4	70 09.1	39.2	261 30.3	18.1	134 58.9	38.4	190 26.7	159	4 53.3	−128
	9	3 36.8	289 49.3	•• 33.8	85 11.2	•• 39.3	276 32.2	•• 18.1	150 01.5	•• 38.4	205 01.6	159	• 4 40.5	−128
	10	18 39.3	304 48.5	34.3	100 13.2	39.4	291 34.2	18.2	165 04.2	38.3	219 36.5	159	4 27.7	−128
	11	33 41.8	319 47.7	34.7	115 15.3	39.5	306 36.1	18.2	180 06.8	38.3	234 11.4	160	4 14.9	−128
	12	48 44.2	334 46.9	+23 35.1	130 17.4	−24 39.6	321 38.0	+23 18.2	195 09.4	−10 38.2	248 46.4	160	+ 4 02.1	−128
	13	63 46.7	349 46.1	35.6	145 19.4	39.8	336 39.9	18.2	210 12.1	38.2	263 21.4	160	3 49.3	−128
	14	78 49.2	4 45.2	36.0	160 21.5	39.9	351 41.8	18.2	225 14.7	38.1	277 56.4	161	3 36.5	−129
	15	93 51.6	19 44.4	•• 36.4	175 23.6	•• 40.0	6 43.7	•• 18.2	240 17.3	•• 38.0	292 31.5	160	• 3 23.6	−128
	16	108 54.1	34 43.6	36.9	190 25.7	40.1	21 45.6	18.2	255 20.0	38.0	307 06.5	162	3 10.8	−128
	17	123 56.6	49 42.8	37.3	205 27.8	40.2	36 47.5	18.3	270 22.6	37.9	321 41.7	161	2 58.0	−128
	18	138 59.0	64 42.0	+23 37.7	220 29.8	−24 40.3	51 49.4	+23 18.3	285 25.3	−10 37.9	336 16.8	162	+ 2 45.2	−129
	19	154 01.5	79 41.2	38.1	235 31.9	40.4	66 51.3	18.3	300 27.9	37.8	350 52.0	162	2 32.3	−128
	20	169 03.9	94 40.3	38.6	250 34.0	40.6	81 53.2	18.3	315 30.5	37.8	5 27.2	162	2 19.5	−129
	21	184 06.4	109 39.5	•• 39.0	265 36.1	•• 40.7	96 55.2	•• 18.3	330 33.2	•• 37.7	20 02.4	163	• 2 06.6	−128
	22	199 08.9	124 38.7	39.4	280 38.2	40.8	111 57.1	18.3	345 35.8	37.7	34 37.7	163	1 53.8	−128
	23	214 11.3	139 37.9	39.8	295 40.3	40.9	126 59.0	18.3	0 38.4	37.6	49 13.0	162	1 41.0	−129
12	0	229 13.8	154 37.1	+23 40.3	310 42.4	−24 41.0	142 00.9	+23 18.4	15 41.1	−10 37.5	63 48.2	164	+ 1 28.1	−128
	1	244 16.3	169 36.3	40.7	325 44.5	41.1	157 02.8	18.4	30 43.7	37.5	78 23.6	163	1 15.3	−128
	2	259 18.7	184 35.4	41.1	340 46.5	41.3	172 04.7	18.4	45 46.4	37.4	92 58.9	163	1 02.5	−129
	3	274 21.2	199 34.6	•• 41.5	355 48.6	•• 41.4	187 06.6	•• 18.4	60 49.0	•• 37.4	107 34.2	164	• 0 49.6	−128
	4	289 23.7	214 33.8	41.9	10 50.7	41.5	202 08.5	18.4	75 51.6	37.3	122 09.6	164	0 36.8	−128
	5	304 26.1	229 33.0	42.3	25 52.8	41.6	217 10.4	18.4	90 54.3	37.3	136 45.0	164	0 24.0	−128
	6	319 28.6	244 32.2	+23 42.8	40 54.9	−24 41.7	232 12.3	+23 18.4	105 56.9	−10 37.2	151 20.4	164	+ 0 11.2	−129
	7	334 31.0	259 31.3	43.2	55 57.0	41.8	247 14.2	18.5	120 59.5	37.2	165 55.8	165	− 0 01.7	−128
	8	349 33.5	274 30.5	43.6	70 59.1	42.0	262 16.1	18.5	136 02.2	37.1	180 31.3	164	0 14.5	−128
	9	4 36.0	289 29.7	•• 44.0	86 01.2	•• 42.1	277 18.0	•• 18.5	151 04.8	•• 37.1	195 06.7	165	• 0 27.3	−127
	10	19 38.4	304 28.9	44.4	101 03.3	42.2	292 20.0	18.5	166 07.4	37.0	209 42.2	164	0 40.0	−128
	11	34 40.9	319 28.1	44.8	116 05.4	42.3	307 21.9	18.5	181 10.1	36.9	224 17.6	165	0 52.8	−128
	12	49 43.4	334 27.2	+23 45.2	131 07.5	−24 42.4	322 23.8	+23 18.5	196 12.7	−10 36.9	238 53.1	165	− 1 05.6	−128
	13	64 45.8	349 26.4	45.6	146 09.6	42.6	337 25.7	18.5	211 15.4	36.8	253 28.6	165	1 18.4	−127
	14	79 48.3	4 25.6	46.0	161 11.7	42.7	352 27.6	18.6	226 18.0	36.8	268 04.1	165	1 31.1	−127
	15	94 50.8	19 24.8	•• 46.4	176 13.8	•• 42.8	7 29.5	•• 18.6	241 20.6	•• 36.7	282 39.6	165	• 1 43.8	−128
	16	109 53.2	34 23.9	46.8	191 15.9	42.9	22 31.4	18.6	256 23.3	36.7	297 15.1	165	1 56.6	−127
	17	124 55.7	49 23.1	47.2	206 18.1	43.0	37 33.3	18.6	271 25.9	36.6	311 50.6	165	2 09.3	−127
	18	139 58.2	64 22.3	+23 47.6	221 20.2	−24 43.1	52 35.2	+23 18.6	286 28.5	−10 36.6	326 26.1	165	− 2 22.0	−127
	19	155 00.6	79 21.5	48.0	236 22.3	43.3	67 37.1	18.6	301 31.2	36.5	341 01.6	165	2 34.7	−126
	20	170 03.1	94 20.6	48.4	251 24.4	43.4	82 39.0	18.6	316 33.8	36.4	355 37.1	165	2 47.3	−127
	21	185 05.5	109 19.8	•• 48.8	266 26.5	•• 43.5	97 40.9	•• 18.7	331 36.4	•• 36.4	10 12.6	165	• 3 00.0	−126
	22	200 08.0	124 19.0	49.2	281 28.6	43.6	112 42.8	18.7	346 39.1	36.3	24 48.1	165	3 12.6	−127
	23	215 10.5	139 18.2	49.6	296 30.7	43.7	127 44.7	18.7	1 41.7	36.3	39 23.6	165	3 25.3	−126
	24	230 12.9	154 17.4	+23 50.0	311 32.9	−24 43.9	142 46.6	+23 18.7	16 44.4	−10 36.2	53 59.1	165	− 3 37.9	−126
	code	—	− 8	+ 5	+ 20	− 2	+ 19	0	+ 27	0				

G M T	SUN GHA	SUN Dec.
h	° ′	° ′
10 0	180 54.8	+17 25.3
1	195 54.8	25.9
2	210 54.8	26.6
3	225 54.9 ••	27.2
4	240 54.9	27.9
5	255 54.9	28.6
6	270 54.9	+17 29.2
7	285 55.0	29.9
8	300 55.0	30.6
9	315 55.0 ••	31.2
10	330 55.1	31.9
11	345 55.1	32.5
12	0 55.1	+17 33.2
13	15 55.1	33.8
14	30 55.2	34.5
15	45 55.2 ••	35.2
16	60 55.2	35.8
17	75 55.2	36.5
18	90 55.3	+17 37.1
19	105 55.3	37.8
20	120 55.3	38.4
21	135 55.3 ••	39.1
22	150 55.4	39.7
23	165 55.4	40.4
11 0	180 55.4	+17 41.0
1	195 55.4	41.7
2	210 55.5	42.3
3	225 55.5 ••	43.0
4	240 55.5	43.6
5	255 55.5	44.3
6	270 55.5	+17 44.9
7	285 55.6	45.6
8	300 55.6	46.2
9	315 55.6 ••	46.9
10	330 55.6	47.5
11	345 55.6	48.2
12	0 55.7	+17 48.8
13	15 55.7	49.5
14	30 55.7	50.1
15	45 55.7 ••	50.7
16	60 55.7	51.4
17	75 55.8	52.0
18	90 55.8	+17 52.7
19	105 55.8	53.3
20	120 55.8	54.0
21	135 55.8 ••	54.6
22	150 55.9	55.2
23	165 55.9	55.9
12 0	180 55.9	+17 56.5
1	195 55.9	57.2
2	210 55.9	57.8
3	225 55.9 ••	58.4
4	240 56.0	59.1
5	255 56.0	17 59.7
6	270 56.0	+18 00.3
7	285 56.0	01.0
8	300 56.0	01.6
9	315 56.0 ••	02.2
10	330 56.1	02.9
11	345 56.1	03.5
12	0 56.1	+18 04.2
13	15 56.1	04.8
14	30 56.1	05.4
15	45 56.1 ••	06.0
16	60 56.1	06.7
17	75 56.2	07.3
18	90 56.2	+18 07.9
19	105 56.2	08.6
20	120 56.2	09.2
21	135 56.2 ••	09.8
22	150 56.2	10.4
23	165 56.2	11.1
24	180 56.2	+18 11.7
code	–	+ 7

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 52.3	−40 29.1
5	Achernar	336 00.0	−57 27.9
30	Acrux	173 58.6	−62 51.1
19	Adhara	255 47.6	−28 54.7
10	Aldebaran	291 40.6	+16 25.2
32	Alioth	166 58.9	+56 12.5
34	Alkaid	153 33.2	+49 32.4
55	Al Na'ir	28 39.3	−47 10.7
15	Alnilam	276 31.6	− 1 13.8
25	Alphard	218 39.6	− 8 27.8
41	Alphecca	126 48.1	+26 51.9
1	Alpheratz	358 29.7	+28 50.2
51	Altair	62 51.3	+ 8 44.7
2	Ankaa	353 59.6	−42 33.0
42	Antares	113 20.3	−26 20.1
37	Arcturus	146 35.8	+19 25.0
43	Atria	109 01.5	−68 56.8
22	Avior	234 36.5	−59 22.1
13	Bellatrix	279 19.8	+ 6 18.6
16	Betelg'se	271 49.5	+ 7 24.0
17	Canopus	264 16.2	−52 40.4
12	Capella	281 40.4	+45 57.3
53	Deneb	50 01.7	+45 06.7
28	Denebola	183 18.6	+14 49.5
4	Diphda	349 40.5	−18 14.1
27	Dubhe	194 45.5	+62 00.0
14	Elnath	279 09.0	+28 34.3
47	Eltanin	91 06.3	+51 29.4
54	Enif	34 30.6	+ 9 39.8
56	Fomalhaut	16 12.9	−29 51.7
31	Gacrux	172 50.1	−56 51.8
29	Gienah	176 37.7	−17 17.6
35	Hadar	149 50.4	−60 09.5
6	Hamal	328 51.2	+23 14.8
48	Kaus Aust.	84 42.3	−34 24.5
40	Kochab	137 16.5	+74 20.5
57	Markab	14 22.6	+14 57.5
8	Menkar	315 01.7	+ 3 54.7
36	Menkent	148 59.6	−36 09.0
24	Miapl'dus	221 49.5	−69 32.1
9	Mirfak	309 44.4	+49 42.1
50	Nunki	76 52.9	−26 21.3
52	Peacock	54 28.7	−56 52.8
21	Pollux	244 22.0	+28 08.3
20	Procyon	245 46.2	+ 5 20.5
46	R'alhague	96 47.3	+12 35.3
26	Regulus	208 30.6	+12 11.4
11	Rigel	281 54.9	− 8 15.2
38	Rigil Kent.	140 51.9	−60 39.2
44	Sabik	103 03.1	−15 40.3
3	Schedar	350 31.7	+56 17.1
45	Shaula	97 21.7	−37 04.4
18	Sirius	259 13.0	−16 39.2
33	Spica	159 17.7	−10 55.6
23	Suhail	223 25.2	−43 15.2
49	Vega	81 08.7	+38 44.2
39	Zub'g'bi	137 54.2	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 10	Moonrise 11	Moonrise 12	Moonrise 13
N °	h m	h m	h m	h m	h m	h m
72	□	□	10 41	12 39	14 30	16 21
70	1 27	////	10 56	12 44	14 27	16 10
68	2 11	////	11 08	12 49	14 25	16 02
66	2 40	////	11 18	12 53	14 24	15 54
64	3 02	////	11 26	12 56	14 22	15 48
62	3 19	////	11 33	12 58	14 21	15 43
60	3 33	////	11 39	13 01	14 20	15 39
58	3 45	////	11 45	13 03	14 19	15 35
56	3 56	////	11 49	13 05	14 18	15 31
54	4 05	0 28	11 54	13 06	14 18	15 28
52	4 13	1 20	11 57	13 08	14 17	15 25
50	4 21	1 48	12 01	13 09	14 16	15 23
45	4 36	2 33	12 08	13 12	14 15	15 17
40	4 49	3 02	12 14	13 15	14 14	15 12
35	5 00	3 24	12 20	13 17	14 13	15 08
30	5 10	3 41	12 24	13 19	14 12	15 05
20	5 26	4 07	12 32	13 22	14 11	14 59
10	5 40	4 26	12 39	13 25	14 09	14 54
0	5 53	4 41	12 46	13 28	14 08	14 49
10	6 06	4 53	12 52	13 30	14 07	14 44
20	6 20	5 03	12 59	13 33	14 06	14 39
30	6 35	5 12	13 07	13 37	14 05	14 33
35	6 44	5 16	13 12	13 38	14 04	14 30
40	6 54	5 20	13 17	13 41	14 03	14 26
45	7 06	5 24	13 23	13 43	14 02	14 22
50	7 21	5 27	13 30	13 46	14 01	14 16
52	7 27	5 29	13 33	13 47	14 01	14 14
54	7 35	5 30	13 37	13 49	14 00	14 11
56	7 43	5 31	13 41	13 50	13 59	14 09
58	7 53	5 32	13 45	13 52	13 59	14 05
60	8 03	5 33	13 50	13 54	13 58	14 02
S						

Lat.	Sunset	Twlt. ends	Moonset 10	Moonset 11	Moonset 12	Moonset 13
N °	h m	h m	h m	h m	h m	h m
72	□	□	2 53	2 24	2 00	1 36
70	22 33	////	2 35	2 16	1 58	1 42
68	21 46	////	2 22	2 09	1 57	1 46
66	21 16	////	2 10	2 03	1 57	1 50
64	20 54	////	2 01	1 58	1 56	1 53
62	20 36	////	1 52	1 54	1 55	1 56
60	20 21	////	1 45	1 50	1 55	1 58
58	20 09	////	1 39	1 47	1 54	2 01
56	19 58	////	1 33	1 44	1 54	2 02
54	19 49	23 45	1 28	1 41	1 53	2 04
52	19 40	22 38	1 24	1 39	1 53	2 06
50	19 33	22 09	1 20	1 37	1 52	2 07
45	19 17	21 22	1 10	1 32	1 52	2 11
40	19 04	20 53	1 03	1 28	1 51	2 13
35	18 53	20 30	0 56	1 24	1 50	2 16
30	18 43	20 13	0 51	1 21	1 50	2 18
20	18 27	19 47	0 41	1 16	1 49	2 22
10	18 13	19 27	0 32	1 11	1 48	2 25
0	18 00	19 12	0 23	1 06	1 47	2 28
10	17 47	19 00	0 15	1 02	1 47	2 31
20	17 33	18 49	0 06	0 57	1 46	2 34
30	17 18	18 40	24 51	0 51	1 45	2 38
35	17 09	18 36	24 48	0 48	1 44	2 40
40	16 58	18 31	24 44	0 44	1 44	2 42
45	16 46	18 27	24 39	0 39	1 43	2 45
50	16 32	18 24	24 34	0 34	1 42	2 48
52	16 25	18 23	24 32	0 32	1 41	2 50
54	16 17	18 21	24 29	0 29	1 41	2 51
56	16 09	18 20	24 26	0 26	1 40	2 53
58	16 00	18 19	24 22	0 22	1 40	2 55
60	15 49	18 17	24 19	0 19	1 39	2 58
S						

G M T	Equation of Time (App.—Mean) 10	11	12
h	m s	m s	m s
0	+ 3 39.1	+ 3 41.6	+ 3 43.5
6	+ 3 39.7	+ 3 42.1	+ 3 43.9
12	+ 3 40.4	+ 3 42.6	+ 3 44.3
18	+ 3 41.0	+ 3 43.1	+ 3 44.6
24	+ 3 41.6	+ 3 43.5	+ 3 44.9

GMT of Transit
Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
10	18 56	13 40	3 23	14 36	23 02
11	19 38	13 41	3 20	14 33	22 58
12	20 18	13 42	3 17	14 30	22 53
13	20 59	13 44	3 13	14 27	22 49

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.2	0.1	0.2
30			
	0.2	0.1	0.2
45			
	0.2	0.1	0.1
60			
	0.2	0.0	0.1
75			
	0.2	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	10	11	12
°	′	′	′
0			
	13.5	12.8	12.2
4			
	13.5	12.8	12.3
8			
	13.5	12.8	12.3
12			
	13.6	12.8	12.3
16			
	13.6	12.9	12.4
20			
	13.6	12.9	12.4
24			
	13.7	13.0	12.5
28			
	13.7	13.0	12.6
32			
	13.8	13.1	12.7
36			
	13.9	13.2	12.8
40			
	13.9	13.3	12.9
44			
	14.0	13.4	13.0
48			
	14.1	13.5	13.2
52			
	14.2	13.7	13.3
56			
	14.3	13.8	13.5
60			
	14.4	13.9	13.6
64			
	14.5	14.1	13.8
68			
	14.6	14.2	14.0
72			
	14.7	14.3	14.1
76			
	14.8	14.5	14.3
80			
	14.9	14.6	14.5
84			
	15.0	14.8	14.7
88			
	15.1	14.9	14.8
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	10	11	12
°	′	′	′
0			
	16.7	17.2	17.4
4			
	16.7	17.1	17.4
8			
	16.7	17.1	17.4
12			
	16.7	17.1	17.4
16			
	16.6	17.0	17.3
20			
	16.6	17.0	17.3
24			
	16.6	16.9	17.2
28			
	16.5	16.9	17.1
32			
	16.4	16.8	17.0
36			
	16.4	16.7	16.9
40			
	16.3	16.6	16.8
44			
	16.2	16.5	16.6
48			
	16.1	16.4	16.5
52			
	16.1	16.2	16.4
56			
	16.0	16.1	16.2
60			
	15.9	16.0	16.1
64			
	15.8	15.8	15.9
68			
	15.7	15.7	15.7
72			
	15.6	15.6	15.6
76			
	15.4	15.4	15.4
80			
	15.3	15.3	15.2
84			
	15.2	15.1	15.0
88			
	15.1	15.0	14.9
90			

Subtract from table, back cover

Day	GMT h	♈ GHA ° ′	VENUS −3.3 GHA ° ′	VENUS Dec. ° ′	MARS −1.0 GHA ° ′	MARS Dec. ° ′	JUPITER −1.5 GHA ° ′	JUPITER Dec. ° ′	SATURN 0.4 GHA ° ′	SATURN Dec. ° ′	MOON GHA ° ′	code	MOON Dec. ° ′	code
13	0	230 12.9	154 17.4	+23 50.0	311 32.9	−24 43.9	142 46.6	+23 18.7	16 44.4	−10 36.2	53 59.1	165	− 3 37.9	−126
	1	245 15.4	169 16.5	50.4	326 35.0	44.0	157 48.6	18.7	31 47.0	36.2	68 34.6	165	3 50.5	−125
	2	260 17.9	184 15.7	50.8	341 37.1	44.1	172 50.5	18.7	46 49.6	36.1	83 10.1	165	4 03.0	−126
	3	275 20.3	199 14.9	·· 51.2	356 39.2	·· 44.2	187 52.4	·· 18.7	61 52.3	·· 36.1	97 45.6	165	· 4 15.6	−125
	4	290 22.8	214 14.0	51.6	11 41.3	44.3	202 54.3	18.7	76 54.9	36.0	112 21.1	164	4 28.1	−125
	5	305 25.3	229 13.2	52.0	26 43.5	44.5	217 56.2	18.8	91 57.5	36.0	126 56.5	165	4 40.6	−125
	6	320 27.7	244 12.4	+23 52.3	41 45.6	−24 44.6	232 58.1	+23 18.8	107 00.2	−10 35.9	141 32.0	165	− 4 53.1	−125
	7	335 30.2	259 11.6	52.7	56 47.7	44.7	248 00.0	18.8	122 02.8	35.8	156 07.5	164	5 05.6	−125
	8	350 32.7	274 10.7	53.1	71 49.8	44.8	263 01.9	18.8	137 05.4	35.8	170 42.9	164	5 18.1	−124
	9	5 35.1	289 09.9	·· 53.5	86 52.0	·· 45.0	278 03.8	·· 18.8	152 08.1	·· 35.7	185 18.3	165	· 5 30.5	−124
	10	20 37.6	304 09.1	53.9	101 54.1	45.1	293 05.7	18.8	167 10.7	35.7	199 53.8	164	5 42.9	−124
	11	35 40.0	319 08.3	54.3	116 56.2	45.2	308 07.6	18.8	182 13.3	35.6	214 29.2	164	5 55.3	−123
	12	50 42.5	334 07.4	+23 54.6	131 58.4	−24 45.3	323 09.5	+23 18.9	197 16.0	−10 35.6	229 04.6	164	− 6 07.6	−123
	13	65 45.0	349 06.6	55.0	147 00.5	45.4	338 11.4	18.9	212 18.6	35.5	243 40.0	163	6 19.9	−123
	14	80 47.4	4 05.8	55.4	162 02.6	45.6	353 13.3	18.9	227 21.2	35.5	258 15.3	164	6 32.2	−123
	15	95 49.9	19 04.9	·· 55.8	177 04.8	·· 45.7	8 15.2	·· 18.9	242 23.9	·· 35.4	272 50.7	163	· 6 44.5	−123
	16	110 52.4	34 04.1	56.1	192 06.9	45.8	23 17.1	18.9	257 26.5	35.4	287 26.0	163	6 56.8	−122
	17	125 54.8	49 03.3	56.5	207 09.0	45.9	38 19.0	18.9	272 29.1	35.3	302 01.3	163	7 09.0	−122
	18	140 57.3	64 02.5	+23 56.9	222 11.2	−24 46.0	53 20.9	+23 18.9	287 31.8	−10 35.2	316 36.6	163	− 7 21.2	−121
	19	155 59.8	79 01.6	57.3	237 13.3	46.2	68 22.8	18.9	302 34.4	35.2	331 11.9	162	7 33.3	−122
	20	171 02.2	94 00.8	57.6	252 15.5	46.3	83 24.7	19.0	317 37.0	35.1	345 47.1	162	7 45.5	−121
	21	186 04.7	109 00.0	·· 58.0	267 17.6	·· 46.4	98 26.6	·· 19.0	332 39.7	·· 35.1	0 22.3	162	· 7 57.6	−120
	22	201 07.1	123 59.1	58.4	282 19.7	46.5	113 28.5	19.0	347 42.3	35.0	14 57.5	162	8 09.6	−121
	23	216 09.6	138 58.3	58.7	297 21.9	46.7	128 30.4	19.0	2 45.0	35.0	29 32.7	162	8 21.7	−120
14	0	231 12.1	153 57.5	+23 59.1	312 24.0	−24 46.8	143 32.3	+23 19.0	17 47.6	−10 34.9	44 07.9	161	− 8 33.7	−120
	1	246 14.5	168 56.7	59.5	327 26.2	46.9	158 34.3	19.0	32 50.2	34.9	58 43.0	161	8 45.7	−119
	2	261 17.0	183 55.8	23 59.8	342 28.3	47.0	173 36.2	19.0	47 52.9	34.8	73 18.1	161	8 57.6	−119
	3	276 19.5	198 55.0	·24 00.2	357 30.5	·· 47.2	188 38.1	·· 19.1	62 55.5	·· 34.8	87 53.2	160	· 9 09.5	−119
	4	291 21.9	213 54.2	00.5	12 32.6	47.3	203 40.0	19.1	77 58.1	34.7	102 28.2	160	9 21.4	−118
	5	306 24.4	228 53.3	00.9	27 34.8	47.4	218 41.9	19.1	93 00.8	34.7	117 03.2	160	9 33.2	−118
	6	321 26.9	243 52.5	+24 01.3	42 36.9	−24 47.5	233 43.8	+23 19.1	108 03.4	−10 34.6	131 38.2	160	− 9 45.0	−117
	7	336 29.3	258 51.7	01.6	57 39.1	47.7	248 45.7	19.1	123 06.0	34.5	146 13.2	159	9 56.7	−117
	8	351 31.8	273 50.8	02.0	72 41.3	47.8	263 47.6	19.1	138 08.7	34.5	160 48.1	159	10 08.4	−117
	9	6 34.3	288 50.0	·· 02.3	87 43.4	·· 47.9	278 49.5	·· 19.1	153 11.3	·· 34.4	175 23.0	159	·10 20.1	−117
	10	21 36.7	303 49.2	02.7	102 45.6	48.0	293 51.4	19.1	168 13.9	34.4	189 57.9	158	10 31.8	−116
	11	36 39.2	318 48.3	03.0	117 47.7	48.2	308 53.3	19.2	183 16.6	34.3	204 32.7	158	10 43.4	−115
	12	51 41.6	333 47.5	+24 03.4	132 49.9	−24 48.3	323 55.2	+23 19.2	198 19.2	−10 34.3	219 07.5	157	−10 54.9	−115
	13	66 44.1	348 46.7	03.7	147 52.1	48.4	338 57.1	19.2	213 21.8	34.2	233 42.2	158	11 06.4	−115
	14	81 46.6	3 45.8	04.1	162 54.2	48.5	353 59.0	19.2	228 24.5	34.2	248 17.0	156	11 17.9	−114
	15	96 49.0	18 45.0	·· 04.4	177 56.4	·· 48.7	9 00.9	·· 19.2	243 27.1	·· 34.1	262 51.6	157	·11 29.3	−114
	16	111 51.5	33 44.2	04.8	192 58.6	48.8	24 02.8	19.2	258 29.7	34.1	277 26.3	156	11 40.7	−113
	17	126 54.0	48 43.3	05.1	208 00.7	48.9	39 04.7	19.2	273 32.4	34.0	292 00.9	155	11 52.0	−113
	18	141 56.4	63 42.5	+24 05.5	223 02.9	−24 49.0	54 06.6	+23 19.2	288 35.0	−10 34.0	306 35.4	156	−12 03.3	−113
	19	156 58.9	78 41.7	05.8	238 05.1	49.2	69 08.5	19.3	303 37.6	33.9	321 10.0	155	12 14.6	−112
	20	172 01.4	93 40.8	06.1	253 07.2	49.3	84 10.4	19.3	318 40.3	33.8	335 44.5	154	12 25.8	−111
	21	187 03.8	108 40.0	·· 06.5	268 09.4	·· 49.4	99 12.3	·· 19.3	333 42.9	·· 33.8	350 18.9	154	·12 36.9	−111
	22	202 06.3	123 39.2	06.8	283 11.6	49.5	114 14.2	19.3	348 45.5	33.7	4 53.3	154	12 48.0	−111
	23	217 08.8	138 38.3	07.2	298 13.8	49.7	129 16.1	19.3	3 48.2	33.7	19 27.7	153	12 59.1	−110
15	0	232 11.2	153 37.5	+24 07.5	313 15.9	−24 49.8	144 18.0	+23 19.3	18 50.8	−10 33.6	34 02.0	153	−13 10.1	−109
	1	247 13.7	168 36.6	07.8	328 18.1	49.9	159 19.9	19.3	33 53.4	33.6	48 36.3	152	13 21.0	−109
	2	262 16.1	183 35.8	08.2	343 20.3	50.0	174 21.8	19.3	48 56.0	33.5	63 10.5	152	13 31.9	−109
	3	277 18.6	198 35.0	·· 08.5	358 22.5	·· 50.2	189 23.7	·· 19.4	63 58.7	·· 33.5	77 44.7	151	·13 42.8	−108
	4	292 21.1	213 34.1	08.8	13 24.7	50.3	204 25.6	19.4	79 01.3	33.4	92 18.8	151	13 53.6	−107
	5	307 23.5	228 33.3	09.2	28 26.8	50.4	219 27.5	19.4	94 03.9	33.4	106 52.9	150	14 04.3	−107
	6	322 26.0	243 32.5	+24 09.5	43 29.0	−24 50.6	234 29.4	+23 19.4	109 06.6	−10 33.3	121 26.9	150	−14 15.0	−107
	7	337 28.5	258 31.6	09.8	58 31.2	50.7	249 31.3	19.4	124 09.2	33.3	136 00.9	150	14 25.7	−105
	8	352 30.9	273 30.8	10.1	73 33.4	50.8	264 33.2	19.4	139 11.8	33.2	150 34.9	149	14 36.2	−106
	9	7 33.4	288 30.0	·· 10.5	88 35.6	·· 50.9	279 35.1	·· 19.4	154 14.5	·· 33.2	165 08.8	148	·14 46.8	−104
	10	22 35.9	303 29.1	10.8	103 37.8	51.1	294 37.0	19.4	169 17.1	33.1	179 42.6	148	14 57.2	−104
	11	37 38.3	318 28.3	11.1	118 40.0	51.2	309 38.9	19.4	184 19.7	33.0	194 16.4	148	15 07.6	−104
	12	52 40.8	333 27.4	+24 11.4	133 42.2	−24 51.3	324 40.8	+23 19.5	199 22.4	−10 33.0	208 50.2	147	−15 18.0	−102
	13	67 43.2	348 26.6	11.8	148 44.4	51.5	339 42.7	19.5	214 25.0	32.9	223 23.9	146	15 28.2	−103
	14	82 45.7	3 25.8	12.1	163 46.5	51.6	354 44.6	19.5	229 27.6	32.9	237 57.5	146	15 38.5	−101
	15	97 48.2	18 24.9	·· 12.4	178 48.7	·· 51.7	9 46.5	·· 19.5	244 30.3	·· 32.8	252 31.1	145	·15 48.6	−101
	16	112 50.6	33 24.1	12.7	193 50.9	51.8	24 48.4	19.5	259 32.9	32.8	267 04.6	145	15 58.7	−101
	17	127 53.1	48 23.2	13.0	208 53.1	52.0	39 50.3	19.5	274 35.5	32.7	281 38.1	144	16 08.8	− 99
	18	142 55.6	63 22.4	+24 13.3	223 55.3	−24 52.1	54 52.2	+23 19.5	289 38.2	−10 32.7	296 11.5	144	−16 18.7	−100
	19	157 58.0	78 21.6	13.7	238 57.5	52.2	69 54.1	19.5	304 40.8	32.6	310 44.9	143	16 28.7	− 98
	20	173 00.5	93 20.7	14.0	253 59.7	52.4	84 56.0	19.6	319 43.4	32.6	325 18.2	143	16 38.5	− 98
	21	188 03.0	108 19.9	·· 14.3	269 01.9	·· 52.5	99 57.9	·· 19.6	334 46.0	·· 32.5	339 51.5	142	·16 48.3	− 97
	22	203 05.4	123 19.0	14.6	284 04.2	52.6	114 59.8	19.6	349 48.7	32.5	354 24.7	142	16 58.0	− 96
	23	218 07.9	138 18.2	14.9	299 06.4	52.8	130 01.7	19.6	4 51.3	32.4	8 57.9	141	17 07.6	− 96
	24	233 10.4	153 17.4	+24 15.2	314 08.6	−24 52.9	145 03.6	+23 19.6	19 53.9	−10 32.4	23 31.0	140	−17 17.2	− 95
	code	—	− 8	+ 3	+ 22	− 1	+ 19	0	+ 26	+ 1				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
13 0	180 56.2	+18 11.7
1	195 56.3	12.3
2	210 56.3	13.0
3	225 56.3	·· 13.6
4	240 56.3	14.2
5	255 56.3	14.8
6	270 56.3	+18 15.4
7	285 56.3	16.1
8	300 56.3	16.7
9	315 56.3	·· 17.3
10	330 56.3	17.9
11	345 56.4	18.6
12	0 56.4	+18 19.2
13	15 56.4	19.8
14	30 56.4	20.4
15	45 56.4	·· 21.0
16	60 56.4	21.7
17	75 56.4	22.3
18	90 56.4	+18 22.9
19	105 56.4	23.5
20	120 56.4	24.1
21	135 56.4	·· 24.7
22	150 56.4	25.3
23	165 56.4	26.0
14 0	180 56.4	+18 26.6
1	195 56.5	27.2
2	210 56.5	27.8
3	225 56.5	·· 28.4
4	240 56.5	29.0
5	255 56.5	29.6
6	270 56.5	+18 30.2
7	285 56.5	30.9
8	300 56.5	31.5
9	315 56.5	·· 32.1
10	330 56.5	32.7
11	345 56.5	33.3
12	0 56.5	+18 33.9
13	15 56.5	34.5
14	30 56.5	35.1
15	45 56.5	·· 35.7
16	60 56.5	36.3
17	75 56.5	36.9
18	90 56.5	+18 37.5
19	105 56.5	38.1
20	120 56.5	38.7
21	135 56.5	·· 39.3
22	150 56.5	39.9
23	165 56.5	40.5
15 0	180 56.5	+18 41.1
1	195 56.5	41.7
2	210 56.5	42.3
3	225 56.5	·· 42.9
4	240 56.5	43.5
5	255 56.5	44.1
6	270 56.5	+18 44.7
7	285 56.5	45.3
8	300 56.5	45.9
9	315 56.5	·· 46.5
10	330 56.5	47.1
11	345 56.5	47.7
12	0 56.5	+18 48.3
13	15 56.5	48.9
14	30 56.5	49.5
15	45 56.5	·· 50.1
16	60 56.5	50.7
17	75 56.5	51.3
18	90 56.5	+18 51.9
19	105 56.5	52.4
20	120 56.5	53.0
21	135 56.5	·· 53.6
22	150 56.5	54.2
23	165 56.5	54.8
24	180 56.4	+18 55.4
code	—	+ 6

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 52.3	−40 29.1
5	Achernar	336 00.0	−57 27.9
30	Acrux	173 58.6	−62 51.2
19	Adhara	255 47.6	−28 54.7
10	Aldebaran	291 40.6	+16 25.2
32	Alioth	166 58.9	+56 12.5
34	Alkaid	153 33.2	+49 32.4
55	Al Na'ir	28 39.2	−47 10.7
15	Alnilam	276 31.6	− 1 13.8
25	Alphard	218 39.6	− 8 27.8
41	Alphecca	126 48.1	+26 51.9
1	Alpheratz	358 29.7	+28 50.2
51	Altair	62 51.3	+ 8 44.7
2	Ankaa	353 59.5	−42 33.0
42	Antares	113 20.3	−26 20.1
37	Arcturus	146 35.8	+19 25.0
43	Atria	109 01.5	−68 56.8
22	Avior	234 36.5	−59 22.0
13	Bellatrix	279 19.8	+ 6 18.6
16	Betelg'se	271 49.5	+ 7 24.0
17	Canopus	264 16.3	−52 40.4
12	Capella	281 40.4	+45 57.3
53	Deneb	50 01.6	+45 06.7
28	Denebola	183 18.6	+14 49.5
4	Diphda	349 40.5	−18 14.1
27	Dubhe	194 45.5	+62 00.0
14	Elnath	279 09.0	+28 34.3
47	Eltanin	91 06.3	+51 29.4
54	Enif	34 30.6	+ 9 39.8
56	Fomalhaut	16 12.8	−29 51.7
31	Gacrux	172 50.1	−56 51.8
29	Gienah	176 37.7	−17 17.6
35	Hadar	149 50.4	−60 09.5
6	Hamal	328 51.2	+23 14.8
48	Kaus Aust.	84 42.2	−34 24.5
40	Kochab	137 16.5	+74 20.5
57	Markab	14 22.6	+14 57.5
8	Menkar	315 01.7	+ 3 54.7
36	Menkent	148 59.6	−36 09.0
24	Miapl'dus	221 49.5	−69 32.1
9	Mirfak	309 44.4	+49 42.1
50	Nunki	76 52.9	−26 21.3
52	Peacock	54 28.6	−56 52.8
21	Pollux	244 22.0	+28 08.3
20	Procyon	245 46.2	+ 5 20.5
46	R'alhague	96 47.3	+12 35.3
26	Regulus	208 30.6	+12 11.4
11	Rigel	281 54.9	− 8 15.2
38	Rigil Kent.	140 51.9	−60 39.2
44	Sabik	103 03.1	−15 40.3
3	Schedar	350 31.7	+56 17.1
45	Shaula	97 21.7	−37 04.4
18	Sirius	259 13.0	−16 39.2
33	Spica	159 17.7	−10 55.6
23	Suhail	223 25.2	−43 15.2
49	Vega	81 08.7	+38 44.2
39	Zub'g'bi	137 54.2	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 13	Moonrise 14	Moonrise 15	Moonrise 16
N °	h m	h m	h m	h m	h m	h m
72	▭	▭	16 21	18 22	20 57	■
70	0 59	////	16 10	17 59	20 02	■
68	1 55	////	16 02	17 41	19 29	21 37
66	2 28	////	15 54	17 27	19 05	20 51
64	2 52	////	15 48	17 16	18 47	20 21
62	3 11	////	15 43	17 06	18 32	19 59
60	3 26	////	15 39	16 58	18 19	19 41
58	3 39	////	15 35	16 51	18 08	19 26
56	3 50	////	15 31	16 45	17 59	19 14
54	4 00	////	15 28	16 39	17 51	19 03
52	4 08	1 05	15 25	16 34	17 43	18 53
50	4 16	1 39	15 23	16 29	17 36	18 44
45	4 33	2 27	15 17	16 19	17 22	18 26
40	4 46	2 57	15 12	16 11	17 11	18 11
35	4 58	3 20	15 08	16 04	17 01	17 58
30	5 08	3 38	15 05	15 58	16 52	17 47
20	5 25	4 05	14 59	15 48	16 37	17 29
10	5 39	4 24	14 54	15 38	16 24	17 12
0	5 53	4 40	14 49	15 30	16 12	16 57
10	6 06	4 53	14 44	15 21	16 01	16 42
20	6 21	5 04	14 39	15 12	15 48	16 26
30	6 37	5 13	14 33	15 02	15 34	16 08
35	6 46	5 19	14 30	14 56	15 25	15 58
40	6 57	5 22	14 26	14 50	15 16	15 46
45	7 09	5 27	14 22	14 42	15 05	15 31
50	7 25	5 31	14 16	14 33	14 52	15 14
52	7 32	5 33	14 14	14 29	14 45	15 06
54	7 39	5 34	14 11	14 24	14 39	14 57
56	7 48	5 36	14 09	14 19	14 31	14 47
58	7 58	5 37	14 05	14 13	14 23	14 36
60	8 10	5 39	14 02	14 07	14 13	14 22
S						

Lat.	Sunset	Twlt. ends	Moonset 13	Moonset 14	Moonset 15	Moonset 16
N °	h m	h m	h m	h m	h m	h m
72	▭	▭	1 36	1 10	{0 37 / 23 31}	■
70	23 05	////	1 42	1 23	1 01	0 28
68	22 02	////	1 46	1 34	1 20	1 02
66	21 28	////	1 50	1 43	1 36	1 27
64	21 03	////	1 53	1 50	1 48	1 46
62	20 44	////	1 56	1 57	1 59	2 02
60	20 28	////	1 58	2 03	2 08	2 15
58	20 15	////	2 01	2 08	2 16	2 27
56	20 04	////	2 02	2 12	2 23	2 37
54	19 54	////	2 04	2 16	2 30	2 46
52	19 45	22 54	2 06	2 20	2 35	2 54
50	19 37	22 18	2 07	2 23	2 41	3 01
45	19 21	21 29	2 11	2 30	2 52	3 16
40	19 07	20 57	2 13	2 37	3 01	3 29
35	18 55	20 33	2 16	2 42	3 09	3 40
30	18 45	20 15	2 18	2 46	3 17	3 49
20	18 28	19 48	2 22	2 54	3 29	4 06
10	18 14	19 29	2 25	3 02	3 40	4 20
0	18 00	19 13	2 28	3 08	3 50	4 34
10	17 46	18 59	2 31	3 15	4 00	4 47
20	17 32	18 48	2 34	3 22	4 11	5 02
30	17 16	18 39	2 38	3 30	4 24	5 19
35	17 06	18 33	2 40	3 35	4 31	5 28
40	16 56	18 30	2 42	3 41	4 40	5 40
45	16 43	18 25	2 45	3 47	4 50	5 53
50	16 28	18 21	2 48	3 55	5 02	6 09
52	16 20	18 18	2 50	3 58	5 07	6 17
54	16 13	18 18	2 51	4 02	5 13	6 25
56	16 04	18 16	2 53	4 06	5 20	6 35
58	15 54	18 14	2 55	4 11	5 28	6 45
60	15 42	18 12	2 58	4 17	5 37	6 58
S						

GMT	Equation of Time (App.—Mean) 13	14	15
h	m s	m s	m s
0	+ 3 44.9	+ 3 45.8	+ 3 46.1
6	+ 3 45.2	+ 3 45.9	+ 3 46.1
12	+ 3 45.4	+ 3 46.0	+ 3 46.0
18	+ 3 45.6	+ 3 46.1	+ 3 45.9
24	+ 3 45.8	+ 3 46.1	+ 3 45.8

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
13	20 59	13 44	3 13	14 27	22 49
14	21 40	13 45	3 10	14 24	22 45
15	22 23	13 46	3 07	14 21	22 41
16	23 09	13 48	3 03	14 18	22 36

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.2	0.1	0.2
30	0.2	0.1	0.2
45	0.2	0.1	0.1
60	0.2	0.0	0.1
75	0.2	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	13	14	15
°	′	′	′
0	11.9	11.7	11.7
4	11.9	11.7	11.7
8	11.9	11.8	11.8
12	11.9	11.8	11.8
16	12.0	11.9	11.9
20	12.1	12.0	12.0
24	12.2	12.0	12.0
28	12.2	12.1	12.1
32	12.4	12.2	12.2
36	12.5	12.4	12.4
40	12.6	12.5	12.5
44	12.7	12.6	12.6
48	12.9	12.8	12.8
52	13.1	13.0	13.0
56	13.2	13.1	13.1
60	13.4	13.3	13.3
64	13.6	13.5	13.5
68	13.8	13.7	13.7
72	14.0	13.9	13.9
76	14.2	14.1	14.1
80	14.4	14.3	14.3
84	14.6	14.5	14.5
88	14.7	14.7	14.7
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	13	14	15
°	′	′	′
0	17.7	17.7	17.7
4	17.6	17.7	17.7
8	17.6	17.7	17.7
12	17.6	17.6	17.6
16	17.5	17.6	17.6
20	17.5	17.5	17.5
24	17.4	17.4	17.4
28	17.3	17.3	17.3
32	17.2	17.2	17.2
36	17.0	17.1	17.1
40	16.9	17.0	17.0
44	16.8	16.8	16.8
48	16.6	16.7	16.7
52	16.5	16.5	16.5
56	16.3	16.3	16.3
60	16.1	16.1	16.1
64	15.9	16.0	16.0
68	15.8	15.8	15.8
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.2	15.2	15.2
84	15.0	14.9	14.9
88	14.8	14.8	14.8
90			

Subtract from table, back cover

992941°—53——6

GMT		♈ GHA	VENUS −3.4 GHA	VENUS Dec.	MARS −1.2 GHA	MARS Dec.	JUPITER −1.5 GHA	JUPITER Dec.	SATURN 0.5 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
16	0	233 10.4	153 17.4	+24 15.2	314 08.6	−24 52.9	145 03.6	+23 19.6	19 53.9	−10 32.4	23 31.0	140	−17 17.2	−95
	1	248 12.8	168 16.5	15.5	329 10.8	53.0	160 05.5	19.6	34 56.6	32.3	38 04.0	140	17 26.7	−94
	2	263 15.3	183 15.7	15.8	344 13.0	53.1	175 07.4	19.6	49 59.2	32.3	52 37.0	139	17 36.1	−94
	3	278 17.7	198 14.8	•• 16.1	359 15.2	•• 53.3	190 09.3	•• 19.6	65 01.8	•• 32.2	67 09.9	139	·17 45.5	−93
	4	293 20.2	213 14.0	16.4	14 17.4	53.4	205 11.2	19.6	80 04.5	32.2	81 42.8	138	17 54.8	−92
	5	308 22.7	228 13.2	16.7	29 19.6	53.5	220 13.1	19.7	95 07.1	32.1	96 15.6	137	18 04.0	−91
	6	323 25.1	243 12.3	+24 17.0	44 21.8	−24 53.7	235 15.0	+23 19.7	110 09.7	−10 32.0	110 48.3	137	−18 13.1	−91
	7	338 27.6	258 11.5	17.3	59 24.1	53.8	250 16.9	19.7	125 12.4	32.0	125 21.0	136	18 22.2	−90
	8	353 30.1	273 10.6	17.6	74 26.3	53.9	265 18.7	19.7	140 15.0	31.9	139 53.6	136	18 31.2	−89
	9	8 32.5	288 09.8	•• 17.9	89 28.5	•• 54.1	280 20.6	•• 19.7	155 17.6	•• 31.9	154 26.2	135	·18 40.1	−88
	10	23 35.0	303 09.0	18.2	104 30.7	54.2	295 22.5	19.7	170 20.2	31.8	168 58.7	135	18 48.9	−88
	11	38 37.5	318 08.1	18.5	119 32.9	54.3	310 24.4	19.7	185 22.9	31.8	183 31.2	133	18 57.7	−87
	12	53 39.9	333 07.3	+24 18.8	134 35.2	−24 54.5	325 26.3	+23 19.7	200 25.5	−10 31.7	198 03.5	134	−19 06.4	−86
	13	68 42.4	348 06.4	19.1	149 37.4	54.6	340 28.2	19.7	215 28.1	31.7	212 35.9	132	19 15.0	−85
	14	83 44.8	3 05.6	19.4	164 39.6	54.7	355 30.1	19.8	230 30.8	31.6	227 08.1	132	19 23.5	−85
	15	98 47.3	18 04.7	•• 19.7	179 41.8	•• 54.9	10 32.0	•• 19.8	245 33.4	•• 31.6	241 40.3	132	·19 32.0	−83
	16	113 49.8	33 03.9	20.0	194 44.1	55.0	25 33.9	19.8	260 36.0	31.5	256 12.5	131	19 40.3	−83
	17	128 52.2	48 03.1	20.2	209 46.3	55.1	40 35.8	19.8	275 38.7	31.5	270 44.6	130	19 48.6	−82
	18	143 54.7	63 02.2	+24 20.5	224 48.5	−24 55.3	55 37.7	+23 19.8	290 41.3	−10 31.4	285 16.6	130	−19 56.8	−81
	19	158 57.2	78 01.4	20.8	239 50.8	55.4	70 39.6	19.8	305 43.9	31.4	299 48.6	129	20 04.9	−80
	20	173 59.6	93 00.5	21.1	254 53.0	55.5	85 41.5	19.8	320 46.5	31.3	314 20.5	128	20 12.9	−80
	21	189 02.1	107 59.7	•• 21.4	269 55.2	•• 55.7	100 43.4	•• 19.8	335 49.2	•• 31.3	328 52.3	128	·20 20.9	−78
	22	204 04.6	122 58.8	21.7	284 57.5	55.8	115 45.3	19.8	350 51.8	31.2	343 24.1	127	20 28.7	−78
	23	219 07.0	137 58.0	21.9	299 59.7	55.9	130 47.2	19.8	5 54.4	31.2	357 55.8	126	20 36.5	−76
17	0	234 09.5	152 57.1	+24 22.2	315 01.9	−24 56.1	145 49.1	+23 19.9	20 57.1	−10 31.1	12 27.4	126	−20 44.1	−76
	1	249 12.0	167 56.3	22.5	330 04.2	56.2	160 51.0	19.9	35 59.7	31.1	26 59.0	125	20 51.7	−75
	2	264 14.4	182 55.5	22.8	345 06.4	56.3	175 52.9	19.9	51 02.3	31.0	41 30.5	125	20 59.2	−74
	3	279 16.9	197 54.6	•• 23.0	0 08.7	•• 56.5	190 54.8	•• 19.9	66 04.9	•• 31.0	56 02.0	124	·21 06.6	−73
	4	294 19.3	212 53.8	23.3	15 10.9	56.6	205 56.7	19.9	81 07.6	30.9	70 33.4	124	21 13.9	−72
	5	309 21.8	227 52.9	23.6	30 13.1	56.7	220 58.6	19.9	96 10.2	30.8	85 04.8	122	21 21.1	−72
	6	324 24.3	242 52.1	+24 23.9	45 15.4	−24 56.9	236 00.5	+23 19.9	111 12.8	−10 30.8	99 36.0	123	−21 28.3	−70
	7	339 26.7	257 51.2	24.1	60 17.6	57.0	251 02.4	19.9	126 15.5	30.7	114 07.3	121	21 35.3	−69
	8	354 29.2	272 50.4	24.4	75 19.9	57.1	266 04.2	19.9	141 18.1	30.7	128 38.4	121	21 42.2	−69
	9	9 31.7	287 49.5	•• 24.7	90 22.1	•• 57.3	281 06.1	•• 20.0	156 20.7	•• 30.6	143 09.5	120	·21 49.1	−67
	10	24 34.1	302 48.7	24.9	105 24.4	57.4	296 08.0	20.0	171 23.3	30.6	157 40.5	120	21 55.8	−67
	11	39 36.6	317 47.8	25.2	120 26.6	57.5	311 09.9	20.0	186 26.0	30.5	172 11.5	119	22 02.5	−65
	12	54 39.1	332 47.0	+24 25.5	135 28.9	−24 57.7	326 11.8	+23 20.0	201 28.6	−10 30.5	186 42.4	119	−22 09.0	−64
	13	69 41.5	347 46.2	25.7	150 31.1	57.8	341 13.7	20.0	216 31.2	30.4	201 13.3	118	22 15.4	−64
	14	84 44.0	2 45.3	26.0	165 33.4	58.0	356 15.6	20.0	231 33.9	30.4	215 44.1	117	22 21.8	−62
	15	99 46.5	17 44.5	•• 26.2	180 35.7	•• 58.1	11 17.5	•• 20.0	246 36.5	•• 30.3	230 14.8	117	·22 28.0	−62
	16	114 48.9	32 43.6	26.5	195 37.9	58.2	26 19.4	20.0	261 39.1	30.3	244 45.5	116	22 34.2	−60
	17	129 51.4	47 42.8	26.8	210 40.2	58.4	41 21.3	20.0	276 41.7	30.2	259 16.1	116	22 40.2	−60
	18	144 53.8	62 41.9	+24 27.0	225 42.4	−24 58.5	56 23.2	+23 20.0	291 44.4	−10 30.2	273 46.7	115	−22 46.2	−58
	19	159 56.3	77 41.1	27.3	240 44.7	58.6	71 25.1	20.1	306 47.0	30.1	288 17.2	114	22 52.0	−57
	20	174 58.8	92 40.2	27.5	255 47.0	58.8	86 27.0	20.1	321 49.6	30.1	302 47.6	114	22 57.7	−56
	21	190 01.2	107 39.4	•• 27.8	270 49.2	•• 58.9	101 28.9	•• 20.1	336 52.3	•• 30.0	317 18.0	113	·23 03.3	−56
	22	205 03.7	122 38.5	28.0	285 51.5	59.1	116 30.8	20.1	351 54.9	30.0	331 48.3	113	23 08.9	−54
	23	220 06.2	137 37.7	28.3	300 53.8	59.2	131 32.7	20.1	6 57.5	29.9	346 18.6	112	23 14.3	−53
18	0	235 08.6	152 36.8	+24 28.5	315 56.0	−24 59.3	146 34.6	+23 20.1	22 00.1	−10 29.9	0 48.8	111	−23 19.6	−52
	1	250 11.1	167 36.0	28.8	330 58.3	59.5	161 36.4	20.1	37 02.8	29.8	15 18.9	111	23 24.8	−51
	2	265 13.6	182 35.1	29.0	346 00.6	59.6	176 38.3	20.1	52 05.4	29.8	29 49.0	111	23 29.9	−49
	3	280 16.0	197 34.3	•• 29.3	1 02.9	•• 59.7	191 40.2	•• 20.1	67 08.0	•• 29.7	44 19.1	110	·23 34.8	−49
	4	295 18.5	212 33.4	29.5	16 05.1	24 59.9	206 42.1	20.1	82 10.6	29.7	58 49.1	109	23 39.7	−47
	5	310 21.0	227 32.6	29.8	31 07.4	25 00.0	221 44.0	20.2	97 13.3	29.6	73 19.0	109	23 44.4	−47
	6	325 23.4	242 31.7	+24 30.0	46 09.7	−25 00.2	236 45.9	+23 20.2	112 15.9	−10 29.6	87 48.9	108	−23 49.1	−45
	7	340 25.9	257 30.9	30.2	61 12.0	00.3	251 47.8	20.2	127 18.5	29.5	102 18.7	108	23 53.6	−44
	8	355 28.3	272 30.0	30.5	76 14.2	00.4	266 49.7	20.2	142 21.2	29.5	116 48.5	107	23 58.0	−43
	9	10 30.8	287 29.2	•• 30.7	91 16.5	•• 00.6	281 51.6	•• 20.2	157 23.8	•• 29.4	131 18.2	107	·24 02.3	−42
	10	25 33.3	302 28.3	31.0	106 18.8	00.7	296 53.5	20.2	172 26.4	29.4	145 47.9	107	24 06.5	−41
	11	40 35.7	317 27.5	31.2	121 21.1	00.9	311 55.4	20.2	187 29.0	29.3	160 17.6	105	24 10.6	−40
	12	55 38.2	332 26.6	+24 31.4	136 23.4	−25 01.0	326 57.3	+23 20.2	202 31.7	−10 29.3	174 47.1	106	−24 14.6	−38
	13	70 40.7	347 25.8	31.7	151 25.7	01.1	341 59.2	20.2	217 34.3	29.2	189 16.7	105	24 18.4	−37
	14	85 43.1	2 24.9	31.9	166 28.0	01.3	357 01.1	20.2	232 36.9	29.2	203 46.2	104	24 22.1	−36
	15	100 45.6	17 24.1	•• 32.1	181 30.2	•• 01.4	12 02.9	•• 20.2	247 39.5	•• 29.1	218 15.6	104	·24 25.7	−35
	16	115 48.1	32 23.2	32.4	196 32.5	01.6	27 04.8	20.3	262 42.2	29.1	232 45.0	103	24 29.2	−34
	17	130 50.5	47 22.4	32.6	211 34.8	01.7	42 06.7	20.3	277 44.8	29.0	247 14.3	103	24 32.6	−32
	18	145 53.0	62 21.5	+24 32.8	226 37.1	−25 01.8	57 08.6	+23 20.3	292 47.4	−10 29.0	261 43.6	103	−24 35.8	−32
	19	160 55.4	77 20.7	33.0	241 39.4	02.0	72 10.5	20.3	307 50.0	28.9	276 12.9	102	24 39.0	−30
	20	175 57.9	92 19.8	33.3	256 41.7	02.1	87 12.4	20.3	322 52.7	28.9	290 42.1	102	24 42.0	−28
	21	191 00.4	107 19.0	•• 33.5	271 44.0	•• 02.3	102 14.3	•• 20.3	337 55.3	•• 28.8	305 11.3	101	·24 44.8	−28
	22	206 02.8	122 18.1	33.7	286 46.3	02.4	117 16.2	20.3	352 57.9	28.8	319 40.4	101	24 47.6	−27
	23	221 05.3	137 17.3	33.9	301 48.6	02.6	132 18.1	20.3	8 00.5	28.7	334 09.5	100	24 50.3	−25
	24	236 07.8	152 16.4	+24 34.2	316 50.9	−25 02.7	147 20.0	+23 20.3	23 03.2	−10 28.7	348 38.5	100	−24 52.8	−24
code		−	−8	+2	+22	−1	+19	0	+26	+1				

GMT		SUN GHA	SUN Dec.
	h	° ′	° ′
16	0	180 56.4	+18 55.4
	1	195 56.4	56.0
	2	210 56.4	56.6
	3	225 56.4	•• 57.1
	4	240 56.4	57.7
	5	255 56.4	58.3
	6	270 56.4	+18 58.9
	7	285 56.4	18 59.5
	8	300 56.4	19 00.1
	9	315 56.4	•• 00.6
	10	330 56.4	01.2
	11	345 56.4	01.8
	12	0 56.4	+19 02.4
	13	15 56.3	03.0
	14	30 56.3	03.6
	15	45 56.3	•• 04.1
	16	60 56.3	04.7
	17	75 56.3	05.3
	18	90 56.3	+19 05.9
	19	105 56.3	06.4
	20	120 56.3	07.0
	21	135 56.3	•• 07.6
	22	150 56.3	08.2
	23	165 56.2	08.7
17	0	180 56.2	+19 09.3
	1	195 56.2	09.9
	2	210 56.2	10.5
	3	225 56.2	•• 11.0
	4	240 56.2	11.6
	5	255 56.2	12.2
	6	270 56.2	+19 12.7
	7	285 56.1	13.3
	8	300 56.1	13.9
	9	315 56.1	•• 14.5
	10	330 56.1	15.0
	11	345 56.1	15.6
	12	0 56.1	+19 16.2
	13	15 56.1	16.7
	14	30 56.0	17.3
	15	45 56.0	•• 17.9
	16	60 56.0	18.4
	17	75 56.0	19.0
	18	90 56.0	+19 19.6
	19	105 56.0	20.1
	20	120 56.0	20.7
	21	135 55.9	•• 21.2
	22	150 55.9	21.8
	23	165 55.9	22.4
18	0	180 55.9	+19 22.9
	1	195 55.9	23.5
	2	210 55.8	24.0
	3	225 55.8	•• 24.6
	4	240 55.8	25.2
	5	255 55.8	25.7
	6	270 55.8	+19 26.3
	7	285 55.8	26.8
	8	300 55.7	27.4
	9	315 55.7	•• 27.9
	10	330 55.7	28.5
	11	345 55.7	29.1
	12	0 55.7	+19 29.6
	13	15 55.6	30.2
	14	30 55.6	30.7
	15	45 55.6	•• 31.3
	16	60 55.6	31.8
	17	75 55.5	32.4
	18	90 55.5	+19 32.9
	19	105 55.5	33.5
	20	120 55.5	34.0
	21	135 55.5	•• 34.6
	22	150 55.4	35.1
	23	165 55.4	35.7
	24	180 55.4	+19 36.2
code		—	+ 5

STARS No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 52.3	−40 29.1
5	Achernar	336 00.0	−57 27.9
30	Acrux	173 58.7	−62 51.2
19	Adhara	255 47.6	−28 54.7
10	Aldebaran	291 40.6	+16 25.2
32	Alioth	166 58.9	+56 12.5
34	Alkaid	153 33.2	+49 32.4
55	Al Na'ir	28 39.2	−47 10.7
15	Alnilam	276 31.6	− 1 13.8
25	Alphard	218 39.7	− 8 27.8
41	Alphecca	126 48.1	+26 51.9
1	Alpheratz	358 29.6	+28 50.2
51	Altair	62 51.3	+ 8 44.7
2	Ankaa	353 59.5	−42 33.0
42	Antares	113 20.3	−26 20.1
37	Arcturus	146 35.8	+19 25.0
43	Atria	109 01.4	−68 56.9
22	Avior	234 36.5	−59 22.0
13	Bellatrix	279 19.8	+ 6 18.6
16	Betelg'se	271 49.5	+ 7 24.0
17	Canopus	264 16.3	−52 40.4
12	Capella	281 40.4	+45 57.3
53	Deneb	50 01.6	+45 06.8
28	Denebola	183 18.6	+14 49.5
4	Diphda	349 40.5	−18 14.1
27	Dubhe	194 45.5	+62 00.0
14	Elnath	279 09.0	+28 34.3
47	Eltanin	91 06.3	+51 29.4
54	Enif	34 30.6	+ 9 39.8
56	Fomalhaut	16 12.8	−29 51.7
31	Gacrux	172 50.1	−56 51.8
29	Gienah	176 37.7	−17 17.6
35	Hadar	149 50.4	−60 09.5
6	Hamal	328 51.2	+23 14.8
48	Kaus Aust.	84 42.2	−34 24.5
40	Kochab	137 16.5	+74 20.5
57	Markab	14 22.6	+14 57.5
8	Menkar	315 01.7	+ 3 54.7
36	Menkent	148 59.6	−36 09.0
24	Miapl'dus	221 49.6	−69 32.1
9	Mirfak	309 44.4	+49 42.0
50	Nunki	76 52.9	−26 21.3
52	Peacock	54 28.6	−56 52.8
21	Pollux	244 22.0	+28 08.3
20	Procyon	245 46.3	+ 5 20.5
46	R'alhague	96 47.3	+12 35.4
26	Regulus	208 30.6	+12 11.4
11	Rigel	281 54.9	− 8 15.2
38	Rigil Kent.	140 51.9	−60 39.2
44	Sabik	103 03.0	−15 40.3
3	Schedar	350 31.7	+56 17.1
45	Shaula	97 21.7	−37 04.4
18	Sirius	259 13.0	−16 39.2
33	Spica	159 17.7	−10 55.6
23	Suhail	223 25.2	−43 15.2
49	Vega	81 08.6	+38 44.2
39	Zub'g'bi	137 54.2	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 16	Moonrise 17	Moonrise 18	Moonrise 19
N °	h m	h m	h m	h m	h m	h m
72	□	□	■	■	■	■
70	□	□	■	■	■	■
68	1 38	////	21 37	■	■	■
66	2 16	////	20 51	22 57	■	■
64	2 42	////	20 21	22 00	23 35	24 42
62	3 02	////	19 59	21 26	22 47	23 48
60	3 19	////	19 41	21 02	22 16	23 15
58	3 33	////	19 26	20 43	21 53	22 51
56	3 44	////	19 14	20 27	21 34	22 31
54	3 55	////	19 03	20 13	21 18	22 15
52	4 04	0 47	18 53	20 01	21 05	22 01
50	4 12	1 27	18 44	19 50	20 53	21 49
45	4 29	2 20	18 26	19 28	20 28	21 24
40	4 43	2 53	18 11	19 11	20 09	21 03
35	4 55	3 17	17 58	18 56	19 53	20 47
30	5 06	3 35	17 47	18 43	19 38	20 32
20	5 23	4 04	17 29	18 21	19 15	20 08
10	5 39	4 24	17 12	18 02	18 54	19 46
0	5 53	4 40	16 57	17 45	18 35	19 26
10	6 07	4 54	16 42	17 27	18 16	19 07
20	6 22	5 05	16 26	17 09	17 55	18 46
30	6 39	5 15	16 08	16 47	17 31	18 21
35	6 49	5 20	15 58	16 35	17 18	18 07
40	7 00	5 25	15 46	16 20	17 02	17 50
45	7 13	5 30	15 31	16 03	16 43	17 30
50	7 29	5 34	15 14	15 43	16 19	17 05
52	7 36	5 36	15 06	15 33	16 07	16 53
54	7 45	5 38	14 57	15 21	15 54	16 39
56	7 54	5 39	14 47	15 09	15 40	16 23
58	8 05	5 41	14 36	14 54	15 22	16 04
60	8 17	5 44	14 22	14 37	15 01	15 40
S						

Lat.	Sunset	Twlt. ends	Moonset 16	Moonset 17	Moonset 18	Moonset 19
N °	h m	h m	h m	h m	h m	h m
72	□	□	■	■	■	■
70	□	□	0 28	■	■	■
68	22 20	////	1 02	0 28	■	■
66	21 40	////	1 27	1 15	0 49	■
64	21 13	////	1 46	1 45	1 47	1 56
62	20 52	////	2 02	2 08	2 20	2 45
60	20 35	////	2 15	2 27	2 45	3 15
58	20 21	////	2 27	2 42	3 04	3 39
56	20 09	////	2 37	2 55	3 21	3 57
54	19 59	////	2 46	3 07	3 35	4 13
52	19 50	23 14	2 54	3 17	3 47	4 27
50	19 41	22 29	3 01	3 26	3 58	4 39
45	19 24	21 35	3 16	3 45	4 21	5 04
40	19 10	21 02	3 29	4 01	4 39	5 24
35	18 58	20 38	3 40	4 15	4 54	5 40
30	18 47	20 18	3 49	4 26	5 08	5 54
20	18 30	19 51	4 06	4 46	5 30	6 19
10	18 14	19 29	4 20	5 04	5 50	6 40
0	18 00	19 13	4 34	5 20	6 09	7 00
10	17 46	18 59	4 47	5 36	6 27	7 19
20	17 31	18 48	5 02	5 54	6 47	7 40
30	17 14	18 37	5 19	6 14	7 10	8 05
35	17 04	18 32	5 28	6 26	7 23	8 19
40	16 53	18 27	5 40	6 40	7 39	8 35
45	16 40	18 23	5 53	6 56	7 58	8 55
50	16 24	18 18	6 09	7 16	8 21	9 20
52	16 16	18 15	6 17	7 26	8 32	9 32
54	16 08	18 14	6 25	7 36	8 45	9 46
56	15 58	18 11	6 35	7 49	8 59	10 02
58	15 48	18 09	6 45	8 03	9 17	10 21
60	15 36	18 08	6 58	8 20	9 38	10 45
S						

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
30	0.1	0.1	0.2
45	0.1	0.1	0.2
60	0.1	0.1	0.2
75	0.1	0.0	0.1
90	0.1	0.0	0.0

Moon's Lower Limb **Add**

Alt.	16	17	18
°	′	′	′
0	11.9	12.1	12.5
4	11.9	12.1	12.5
8	11.9	12.2	12.5
12	11.9	12.2	12.6
16	12.0	12.2	12.6
20	12.1	12.3	12.7
24	12.2	12.4	12.7
28	12.2	12.5	12.8
32	12.4	12.6	12.9
36	12.5	12.7	13.0
40	12.6	12.8	13.1
44	12.7	12.9	13.2
48	12.9	13.1	13.4
52	13.1	13.2	13.5
56	13.2	13.4	13.6
60	13.4	13.5	13.8
64	13.6	13.7	13.9
68	13.8	13.9	14.1
72	14.0	14.1	14.2
76	14.2	14.3	14.4
80	14.4	14.4	14.6
84	14.6	14.6	14.7
88	14.7	14.8	14.9
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	16	17	18
°	′	′	′
0	17.7	17.5	17.3
4	17.6	17.5	17.3
8	17.6	17.5	17.3
12	17.6	17.4	17.2
16	17.5	17.4	17.2
20	17.5	17.3	17.1
24	17.4	17.2	17.1
28	17.3	17.2	17.0
32	17.2	17.1	16.9
36	17.0	16.9	16.8
40	16.9	16.8	16.7
44	16.8	16.7	16.6
48	16.6	16.6	16.4
52	16.5	16.4	16.3
56	16.3	16.2	16.2
60	16.1	16.1	16.0
64	15.9	15.9	15.9
68	15.8	15.7	15.7
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.2	15.2	15.2
84	15.0	15.0	15.1
88	14.8	14.9	14.9
90			

Subtract from table, back cover

Equation of Time (App.—Mean)

GMT	16	17	18
h	m s	m s	m s
0	+ 3 45.8	+ 3 45.0	+ 3 43.6
6	+ 3 45.6	+ 3 44.7	+ 3 43.1
12	+ 3 45.4	+ 3 44.3	+ 3 42.7
18	+ 3 45.2	+ 3 44.0	+ 3 42.1
24	+ 3 45.0	+ 3 43.6	+ 3 41.6

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
16	23 09	13 48	3 03	14 18	22 36
17	23 57	13 49	2 59	14 15	22 32
18	24 47	13 50	2 56	14 12	22 28
19	0 47	13 52	2 52	14 09	22 24

Full Moon 17

GMT	♈ GHA	VENUS −3.4 GHA	VENUS Dec.	MARS −1.2 GHA	MARS Dec.	JUPITER −1.5 GHA	JUPITER Dec.	SATURN 0.5 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
19 0	236 07.8	152 16.4	+24 34.2	316 50.9	−25 02.7	147 20.0	+23 20.3	23 03.2	−10 28.7	348 38.5	100	−24 52.8	−24
1	251 10.2	167 15.6	34.4	331 53.2	02.8	162 21.9	20.3	38 05.8	28.6	3 07.5	100	24 55.2	−22
2	266 12.7	182 14.7	34.6	346 55.5	03.0	177 23.7	20.3	53 08.4	28.6	17 36.5	100	24 57.4	−22
3	281 15.2	197 13.9	·· 34.8	1 57.8	·· 03.1	192 25.6	·· 20.4	68 11.0	·· 28.5	32 05.5	99	·24 59.6	−20
4	296 17.6	212 13.0	35.0	17 00.1	03.3	207 27.5	20.4	83 13.7	28.5	46 34.4	98	25 01.6	−19
5	311 20.1	227 12.2	35.2	32 02.4	03.4	222 29.4	20.4	98 16.3	28.4	61 03.2	99	25 03.5	−18
6	326 22.6	242 11.3	+24 35.4	47 04.7	−25 03.5	237 31.3	+23 20.4	113 18.9	−10 28.4	75 32.1	98	−25 05.3	−16
7	341 25.0	257 10.5	35.7	62 07.1	03.7	252 33.2	20.4	128 21.5	28.3	90 00.9	97	25 06.9	−16
8	356 27.5	272 09.6	35.9	77 09.4	03.8	267 35.1	20.4	143 24.2	28.3	104 29.6	98	25 08.5	−14
9	11 29.9	287 08.8	·· 36.1	92 11.7	·· 04.0	282 37.0	·· 20.4	158 26.8	·· 28.2	118 58.4	97	·25 09.9	−12
10	26 32.4	302 07.9	36.3	107 14.0	04.1	297 38.9	20.4	173 29.4	28.2	133 27.1	97	25 11.1	−12
11	41 34.9	317 07.1	36.5	122 16.3	04.3	312 40.8	20.4	188 32.0	28.1	147 55.8	96	25 12.3	−10
12	56 37.3	332 06.2	+24 36.7	137 18.6	−25 04.4	327 42.7	+23 20.4	203 34.7	−10 28.1	162 24.4	96	−25 13.3	−9
13	71 39.8	347 05.4	36.9	152 21.0	04.6	342 44.5	20.4	218 37.3	28.0	176 53.0	96	25 14.2	−7
14	86 42.3	2 04.5	37.1	167 23.3	04.7	357 46.4	20.4	233 39.9	28.0	191 21.6	96	25 14.9	−6
15	101 44.7	17 03.7	·· 37.3	182 25.6	·· 04.8	12 48.3	·· 20.5	248 42.5	·· 27.9	205 50.2	96	·25 15.5	−5
16	116 47.2	32 02.8	37.5	197 27.9	05.0	27 50.2	20.5	263 45.2	27.9	220 18.8	95	25 16.0	−4
17	131 49.7	47 02.0	37.7	212 30.2	05.1	42 52.1	20.5	278 47.8	27.8	234 47.3	95	25 16.4	−2
18	146 52.1	62 01.1	+24 37.9	227 32.6	−25 05.3	57 54.0	+23 20.5	293 50.4	−10 27.8	249 15.8	95	−25 16.6	−2
19	161 54.6	77 00.2	38.1	242 34.9	05.4	72 55.9	20.5	308 53.0	27.7	263 44.3	95	25 16.8	+1
20	176 57.1	91 59.4	38.3	257 37.2	05.6	87 57.8	20.5	323 55.7	27.7	278 12.8	94	25 16.7	+1
21	191 59.5	106 58.5	·· 38.5	272 39.5	·· 05.7	102 59.7	·· 20.5	338 58.3	·· 27.6	292 41.2	95	·25 16.6	+3
22	207 02.0	121 57.7	38.7	287 41.9	05.9	118 01.5	20.5	354 00.9	27.6	307 09.7	94	25 16.3	+4
23	222 04.4	136 56.8	38.9	302 44.2	06.0	133 03.4	20.5	9 03.5	27.5	321 38.1	94	25 15.9	+6
20 0	237 06.9	151 56.0	+24 39.1	317 46.5	−25 06.1	148 05.3	+23 20.5	24 06.2	−10 27.5	336 06.5	94	−25 15.3	+6
1	252 09.4	166 55.1	39.2	332 48.9	06.3	163 07.2	20.5	39 08.8	27.4	350 34.9	94	25 14.7	+8
2	267 11.8	181 54.3	39.4	347 51.2	06.4	178 09.1	20.5	54 11.4	27.4	5 03.3	93	25 13.9	+10
3	282 14.3	196 53.4	·· 39.6	2 53.6	·· 06.6	193 11.0	·· 20.6	69 14.0	·· 27.3	19 31.6	94	·25 12.9	+10
4	297 16.8	211 52.6	39.8	17 55.9	06.7	208 12.9	20.6	84 16.7	27.3	34 00.0	94	25 11.9	+12
5	312 19.2	226 51.7	40.0	32 58.2	06.9	223 14.8	20.6	99 19.3	27.2	48 28.4	93	25 10.7	+14
6	327 21.7	241 50.9	+24 40.2	48 00.6	−25 07.0	238 16.7	+23 20.6	114 21.9	−10 27.2	62 56.7	93	−25 09.3	+14
7	342 24.2	256 50.0	40.4	63 02.9	07.2	253 18.5	20.6	129 24.5	27.1	77 25.0	94	25 07.9	+16
8	357 26.6	271 49.2	40.5	78 05.3	07.3	268 20.4	20.6	144 27.1	27.1	91 53.4	93	25 06.3	+17
9	12 29.1	286 48.3	·· 40.7	93 07.6	·· 07.5	283 22.3	·· 20.6	159 29.8	·· 27.0	106 21.7	93	·25 04.6	+19
10	27 31.6	301 47.4	40.9	108 10.0	07.6	298 24.2	20.6	174 32.4	27.0	120 50.0	93	25 02.7	+20
11	42 34.0	316 46.6	41.1	123 12.3	07.8	313 26.1	20.6	189 35.0	26.9	135 18.3	94	25 00.7	+21
12	57 36.5	331 45.7	+24 41.2	138 14.7	−25 07.9	328 28.0	+23 20.6	204 37.6	−10 26.9	149 46.7	93	−24 58.6	+23
13	72 38.9	346 44.9	41.4	153 17.0	08.1	343 29.9	20.6	219 40.3	26.8	164 15.0	93	24 56.3	+23
14	87 41.4	1 44.0	41.6	168 19.4	08.2	358 31.8	20.6	234 42.9	26.8	178 43.3	93	24 54.0	+25
15	102 43.9	16 43.2	·· 41.8	183 21.7	·· 08.3	13 33.6	·· 20.6	249 45.5	·· 26.7	193 11.6	94	·24 51.5	+27
16	117 46.3	31 42.3	41.9	198 24.1	08.5	28 35.5	20.7	264 48.1	26.7	207 40.0	93	24 48.8	+28
17	132 48.8	46 41.5	42.1	213 26.4	08.6	43 37.4	20.7	279 50.7	26.6	222 08.3	93	24 46.0	+29
18	147 51.3	61 40.6	+24 42.3	228 28.8	−25 08.8	58 39.3	+23 20.7	294 53.4	−10 26.6	236 36.6	94	−24 43.1	+30
19	162 53.7	76 39.8	42.4	243 31.1	08.9	73 41.2	20.7	309 56.0	26.5	251 05.0	93	24 40.1	+32
20	177 56.2	91 38.9	42.6	258 33.5	09.1	88 43.1	20.7	324 58.6	26.5	265 33.3	94	24 36.9	+33
21	192 58.7	106 38.0	·· 42.8	273 35.9	·· 09.2	103 45.0	·· 20.7	340 01.2	·· 26.4	280 01.7	93	·24 33.6	+34
22	208 01.1	121 37.2	42.9	288 38.2	09.4	118 46.9	20.7	355 03.9	26.4	294 30.0	94	24 30.2	+36
23	223 03.6	136 36.3	43.1	303 40.6	09.5	133 48.7	20.7	10 06.5	26.3	308 58.4	94	24 26.6	+36
21 0	238 06.1	151 35.5	+24 43.3	318 43.0	−25 09.7	148 50.6	+23 20.7	25 09.1	−10 26.3	323 26.8	94	−24 23.0	+39
1	253 08.5	166 34.6	43.4	333 45.3	09.8	163 52.5	20.7	40 11.7	26.2	337 55.2	94	24 19.1	+39
2	268 11.0	181 33.8	43.6	348 47.7	10.0	178 54.4	20.7	55 14.3	26.2	352 23.6	94	24 15.2	+41
3	283 13.4	196 32.9	·· 43.7	3 50.1	·· 10.1	193 56.3	·· 20.7	70 17.0	·· 26.1	6 52.0	95	·24 11.1	+42
4	298 15.9	211 32.1	43.9	18 52.4	10.3	208 58.2	20.7	85 19.6	26.1	21 20.5	94	24 06.9	+43
5	313 18.4	226 31.2	44.0	33 54.8	10.4	224 00.1	20.7	100 22.2	26.0	35 48.9	95	24 02.6	+45
6	328 20.8	241 30.3	+24 44.2	48 57.2	−25 10.6	239 01.9	+23 20.8	115 24.8	−10 26.0	50 17.4	95	−23 58.1	+46
7	343 23.3	256 29.5	44.3	63 59.6	10.7	254 03.8	20.8	130 27.4	25.9	64 45.9	95	23 53.5	+47
8	358 25.8	271 28.6	44.5	79 02.0	10.9	269 05.7	20.8	145 30.1	25.9	79 14.4	95	23 48.8	+48
9	13 28.2	286 27.8	·· 44.6	94 04.3	·· 11.0	284 07.6	·· 20.8	160 32.7	·· 25.9	93 42.9	96	·23 44.0	+50
10	28 30.7	301 26.9	44.8	109 06.7	11.2	299 09.5	20.8	175 35.3	25.8	108 11.5	95	23 39.0	+51
11	43 33.2	316 26.1	44.9	124 09.1	11.3	314 11.4	20.8	190 37.9	25.8	122 40.0	96	23 33.9	+52
12	58 35.6	331 25.2	+24 45.1	139 11.5	−25 11.5	329 13.3	+23 20.8	205 40.6	−10 25.7	137 08.6	97	−23 28.7	+54
13	73 38.1	346 24.4	45.2	154 13.9	11.6	344 15.1	20.8	220 43.2	25.7	151 37.3	96	23 23.3	+55
14	88 40.5	1 23.5	45.4	169 16.2	11.8	359 17.0	20.8	235 45.8	25.6	166 05.9	96	23 17.8	+56
15	103 43.0	16 22.6	·· 45.5	184 18.6	·· 11.9	14 18.9	·· 20.8	250 48.4	·· 25.6	180 34.5	97	·23 12.2	+57
16	118 45.5	31 21.8	45.7	199 21.0	12.1	29 20.8	20.8	265 51.0	25.5	195 03.2	97	23 06.5	+58
17	133 47.9	46 20.9	45.8	214 23.4	12.3	44 22.7	20.8	280 53.7	25.5	209 31.9	98	23 00.7	+60
18	148 50.4	61 20.1	+24 45.9	229 25.8	−25 12.4	59 24.6	+23 20.8	295 56.3	−10 25.4	224 00.7	97	−22 54.7	+61
19	163 52.9	76 19.2	46.1	244 28.2	12.6	74 26.5	20.8	310 58.9	25.4	238 29.4	98	22 48.6	+62
20	178 55.3	91 18.4	46.2	259 30.6	12.7	89 28.3	20.8	326 01.5	25.3	252 58.2	98	22 42.4	+63
21	193 57.8	106 17.5	·· 46.3	274 33.0	·· 12.9	104 30.2	·· 20.9	341 04.1	·· 25.3	267 27.0	99	·22 36.1	+65
22	209 00.3	121 16.7	46.5	289 35.4	13.0	119 32.1	20.9	356 06.7	25.2	281 55.9	98	22 29.6	+66
23	224 02.7	136 15.8	46.6	304 37.8	13.2	134 34.0	20.9	11 09.4	25.2	296 24.7	99	22 23.0	+67
24	239 05.2	151 14.9	+24 46.7	319 40.2	−25 13.3	149 35.9	+23 20.9	26 12.0	−10 25.1	310 53.6	100	−22 16.3	+68
code	−	−8	+2	+23	−2	+19	0	+27	+1				

SUN

GMT h	GHA ° ′	Dec. ° ′
19 0	180 55.4	+19 36.2
1	195 55.4	36.7
2	210 55.3	37.3
3	225 55.3	·· 37.8
4	240 55.3	38.4
5	255 55.3	38.9
6	270 55.2	+19 39.5
7	285 55.2	40.0
8	300 55.2	40.6
9	315 55.2	·· 41.1
10	330 55.1	41.6
11	345 55.1	42.2
12	0 55.1	+19 42.7
13	15 55.1	43.3
14	30 55.0	43.8
15	45 55.0	·· 44.3
16	60 55.0	44.9
17	75 55.0	45.4
18	90 54.9	+19 45.9
19	105 54.9	46.5
20	120 54.9	47.0
21	135 54.8	·· 47.5
22	150 54.8	48.1
23	165 54.8	48.6
20 0	180 54.8	+19 49.1
1	195 54.7	49.7
2	210 54.7	50.2
3	225 54.7	·· 50.7
4	240 54.6	51.3
5	255 54.6	51.8
6	270 54.6	+19 52.3
7	285 54.5	52.9
8	300 54.5	53.4
9	315 54.5	·· 53.9
10	330 54.5	54.4
11	345 54.4	55.0
12	0 54.4	+19 55.5
13	15 54.4	56.0
14	30 54.3	56.5
15	45 54.3	·· 57.1
16	60 54.3	57.6
17	75 54.2	58.1
18	90 54.2	+19 58.6
19	105 54.2	59.2
20	120 54.1	19 59.7
21	135 54.1	·20 00.2
22	150 54.1	00.7
23	165 54.0	01.2
21 0	180 54.0	+20 01.8
1	195 54.0	02.3
2	210 53.9	02.8
3	225 53.9	·· 03.3
4	240 53.8	03.8
5	255 53.8	04.3
6	270 53.8	+20 04.9
7	285 53.7	05.4
8	300 53.7	05.9
9	315 53.7	·· 06.4
10	330 53.6	06.9
11	345 53.6	07.4
12	0 53.6	+20 07.9
13	15 53.5	08.4
14	30 53.5	09.0
15	45 53.4	·· 09.5
16	60 53.4	10.0
17	75 53.4	10.5
18	90 53.3	+20 11.0
19	105 53.3	11.5
20	120 53.2	12.0
21	135 53.2	·· 12.5
22	150 53.2	13.0
23	165 53.1	13.5
24	180 53.1	+20 14.0
code	—	+ 5

STARS

No.	Name	SHA ° ′	Dec. ° ′
7	Acamar	315 52.3	−40 29.1
5	Achernar	336 00.0	−57 27.8
30	Acrux	173 58.7	−62 51.2
19	Adhara	255 47.6	−28 54.7
10	Aldebaran	291 40.6	+16 25.2
32	Alioth	166 58.9	+56 12.5
34	Alkaid	153 33.2	+49 32.4
55	Al Na'ir	28 39.2	−47 10.7
15	Alnilam	276 31.6	− 1 13.8
25	Alphard	218 39.7	− 8 27.8
41	Alphecca	126 48.1	+26 51.9
1	Alpheratz	358 29.6	+28 50.2
51	Altair	62 51.2	+ 8 44.7
2	Ankaa	353 59.5	−42 33.0
42	Antares	113 20.3	−26 20.1
37	Arcturus	146 35.8	+19 25.0
43	Atria	109 01.4	−68 56.9
22	Avior	234 36.6	−59 22.0
13	Bellatrix	279 19.8	+ 6 18.6
16	Betelg'se	271 49.5	+ 7 24.0
17	Canopus	264 16.3	−52 40.4
12	Capella	281 40.4	+45 57.3
53	Deneb	50 01.6	+45 06.8
28	Denebola	183 18.6	+14 49.5
4	Diphda	349 40.5	−18 14.1
27	Dubhe	194 45.5	+62 00.0
14	Elnath	279 09.0	+28 34.3
47	Eltanin	91 06.2	+51 29.4
54	Enif	34 30.6	+ 9 39.8
56	Fomalhaut	16 12.8	−29 51.7
31	Gacrux	172 50.1	−56 51.8
29	Gienah	176 37.8	−17 17.6
35	Hadar	149 50.4	−60 09.5
6	Hamal	328 51.1	+23 14.8
48	Kaus Aust.	84 42.2	−34 24.5
40	Kochab	137 16.5	+74 20.5
57	Markab	14 22.6	+14 57.5
8	Menkar	315 01.7	+ 3 54.7
36	Menkent	148 59.6	−36 09.0
24	Miapl'dus	221 49.6	−69 32.1
9	Mirfak	309 44.4	+49 42.0
50	Nunki	76 52.9	−26 21.3
52	Peacock	54 28.6	−56 52.8
21	Pollux	244 22.0	+28 08.3
20	Procyon	245 46.3	+ 5 20.5
46	R'alhague	96 47.2	+12 35.4
26	Regulus	208 30.6	+12 11.4
11	Rigel	281 54.9	− 8 15.2
38	Rigil Kent.	140 51.9	−60 39.2
44	Sabik	103 03.0	−15 40.3
3	Schedar	350 31.6	+56 17.1
45	Shaula	97 21.7	−37 04.4
18	Sirius	259 13.0	−16 39.2
33	Spica	159 17.7	−10 55.6
23	Suhail	223 25.2	−43 15.2
49	Vega	81 08.6	+38 44.2
39	Zub'g'bi	137 54.2	−15 51.4

Sunrise, Twilight, Moonrise

Lat. °	Sunrise h m	Twlt. begins h m	Moonrise 19 h m	Moonrise 20 h m	Moonrise 21 h m	Moonrise 22 h m
N 72	□	□	■	■	■	■
70	□	□	■	■	■	■
68	1 19	////	■	■	■	■
66	2 04	////	■	■	■	1 45
64	2 33	////	24 42	0 42	1 03	1 07
62	2 55	////	23 48	24 22	0 22	0 40
60	3 12	////	23 15	23 54	24 19	0 19
58	3 27	////	22 51	23 33	24 02	0 02
56	3 39	////	22 31	23 15	23 47	24 10
54	3 50	////	22 15	23 00	23 34	24 00
52	4 00	0 19	22 01	22 47	23 23	23 51
50	4 08	1 16	21 49	22 36	23 13	23 43
45	4 26	2 15	21 24	22 12	22 52	23 26
40	4 41	2 49	21 03	21 52	22 35	23 12
35	4 53	3 14	20 47	21 36	22 21	23 00
30	5 04	3 33	20 32	21 22	22 09	22 50
20	5 22	4 02	20 08	20 59	21 47	22 32
10	5 38	4 23	19 46	20 38	21 29	22 17
0	5 53	4 40	19 26	20 19	21 11	22 02
10	6 08	4 53	19 07	20 00	20 54	21 47
20	6 23	5 06	18 46	19 39	20 35	21 32
30	6 41	5 17	18 21	19 15	20 13	21 13
35	6 51	5 22	18 07	19 01	20 01	21 03
40	7 02	5 26	17 50	18 45	19 46	20 51
45	7 16	5 32	17 30	18 26	19 29	20 36
50	7 33	5 37	17 05	18 01	19 07	20 19
52	7 40	5 39	16 53	17 50	18 57	20 10
54	7 49	5 41	16 39	17 36	18 45	20 01
56	7 59	5 43	16 23	17 21	18 31	19 50
58	8 10	5 46	16 04	17 02	18 16	19 38
60 S	8 23	5 48	15 40	16 40	17 57	19 24

Sunset, Twilight, Moonset

Lat. °	Sunset h m	Twlt. ends h m	Moonset 19 h m	Moonset 20 h m	Moonset 21 h m	Moonset 22 h m
N 72	□	□	■	■	■	■
70	□	□	■	■	■	■
68	22 39	////	■	■	■	■
66	21 52	////	■	■	■	5 12
64	21 23	////	1 56	2 38	4 06	5 50
62	21 00	////	2 45	3 32	4 46	6 16
60	20 42	////	3 15	4 04	5 14	6 37
58	20 28	////	3 39	4 28	5 35	6 54
56	20 15	////	3 57	4 48	5 52	7 08
54	20 04	////	4 13	5 04	6 07	7 20
52	19 54	////	4 27	5 18	6 20	7 31
50	19 46	22 42	4 39	5 30	6 31	7 40
45	19 27	21 40	5 04	5 55	6 55	8 00
40	19 12	21 05	5 24	6 15	7 14	8 17
35	19 00	20 41	5 40	6 32	7 29	8 30
30	18 49	20 21	5 54	6 46	7 43	8 42
20	18 31	19 52	6 19	7 11	8 06	9 02
10	18 15	19 31	6 40	7 32	8 26	9 20
0	18 00	19 13	7 00	7 52	8 44	9 36
10	17 46	19 00	7 19	8 11	9 03	9 52
20	17 30	18 47	7 40	8 32	9 22	10 09
30	17 12	18 35	8 05	8 57	9 45	10 29
35	17 02	18 30	8 19	9 11	9 58	10 40
40	16 50	18 25	8 35	9 27	10 13	10 53
45	16 37	18 20	8 55	9 47	10 31	11 08
50	16 20	18 15	9 20	10 11	10 54	11 27
52	16 12	18 12	9 32	10 23	11 04	11 36
54	16 04	18 11	9 46	10 37	11 16	11 46
56	15 54	18 08	10 02	10 52	11 30	11 57
58	15 43	18 06	10 21	11 11	11 46	12 10
60 S	15 30	18 03	10 45	11 34	12 05	12 24

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0	0.1	0.1	0.2
30	0.1	0.1	0.2
45	0.1	0.1	0.2
60	0.1	0.0	0.1
75	0.1	0.0	0.0
90			

Moon's Lower Limb Add

Alt. °	19 ′	20 ′	21 ′
0	12.9	13.4	14.0
4	12.9	13.4	14.0
8	12.9	13.4	14.0
12	12.9	13.4	14.1
16	13.0	13.5	14.1
20	13.0	13.5	14.1
24	13.1	13.6	14.1
28	13.2	13.6	14.2
32	13.2	13.7	14.2
36	13.3	13.7	14.3
40	13.4	13.8	14.3
44	13.5	13.9	14.4
48	13.6	14.0	14.5
52	13.7	14.1	14.5
56	13.9	14.2	14.6
60	14.0	14.3	14.7
64	14.1	14.4	14.7
68	14.3	14.5	14.8
72	14.4	14.6	14.9
76	14.5	14.7	15.0
80	14.7	14.9	15.1
84	14.8	15.0	15.1
88	14.9	15.1	15.2
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt. °	19 ′	20 ′	21 ′
0	17.1	16.8	16.4
4	17.1	16.8	16.4
8	17.0	16.8	16.4
12	17.0	16.7	16.4
16	17.0	16.7	16.4
20	16.9	16.7	16.3
24	16.9	16.6	16.3
28	16.8	16.6	16.3
32	16.7	16.5	16.2
36	16.6	16.4	16.2
40	16.5	16.4	16.1
44	16.4	16.3	16.1
48	16.3	16.2	16.0
52	16.2	16.1	15.9
56	16.1	16.0	15.9
60	16.0	15.9	15.8
64	15.8	15.8	15.7
68	15.7	15.7	15.6
72	15.6	15.6	15.6
76	15.4	15.4	15.5
80	15.3	15.3	15.4
84	15.1	15.2	15.3
88	15.0	15.1	15.2
90			

Subtract from table, back cover

Equation of Time (App.—Mean)

GMT h	19 m s	20 m s	21 m s
0	+ 3 41.6	+ 3 39.1	+ 3 36.0
6	+ 3 41.0	+ 3 38.4	+ 3 35.2
12	+ 3 40.4	+ 3 37.6	+ 3 34.3
18	+ 3 39.8	+ 3 36.8	+ 3 33.4
24	+ 3 39.1	+ 3 36.0	+ 3 32.4

GMT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
19	0 47	13 52	2 52	14 09	22 24
20	1 39	13 53	2 49	14 06	22 20
21	2 32	13 54	2 45	14 03	22 16
22	3 23	13 56	2 41	14 00	22 11

Day	GMT	♈ GHA	VENUS −3.4 GHA	VENUS Dec.	MARS −1.4 GHA	MARS Dec.	JUPITER −1.5 GHA	JUPITER Dec.	SATURN 0.5 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
22	0	239 05.2	151 14.9	+24 46.7	319 40.2	−25 13.3	149 35.9	+23 20.9	26 12.0	−10 25.1	310 53.6	100	−22 16.3	+68
	1	254 07.7	166 14.1	46.9	334 42.6	13.5	164 37.8	20.9	41 14.6	25.1	325 22.6	99	22 09.5	+70
	2	269 10.1	181 13.2	47.0	349 45.0	13.6	179 39.6	20.9	56 17.2	25.0	339 51.5	100	22 02.5	+70
	3	284 12.6	196 12.4	·· 47.1	4 47.4	·· 13.8	194 41.5	·· 20.9	71 19.8	·· 25.0	354 20.5	101	·21 55.5	+72
	4	299 15.0	211 11.5	47.3	19 49.8	13.9	209 43.4	20.9	86 22.5	24.9	8 49.6	100	21 48.3	+73
	5	314 17.5	226 10.7	47.4	34 52.2	14.1	224 45.3	20.9	101 25.1	24.9	23 18.6	101	21 41.0	+74
	6	329 20.0	241 09.8	+24 47.5	49 54.6	−25 14.2	239 47.2	+23 20.9	116 27.7	−10 24.8	37 47.7	101	−21 33.6	+75
	7	344 22.4	256 08.9	47.6	64 57.0	14.4	254 49.1	20.9	131 30.3	24.8	52 16.8	102	21 26.1	+77
	8	359 24.9	271 08.1	47.7	79 59.4	14.6	269 51.0	20.9	146 32.9	24.8	66 46.0	101	21 18.4	+77
	9	14 27.4	286 07.2	·· 47.9	95 01.8	·· 14.7	284 52.8	·· 20.9	161 35.6	·· 24.7	81 15.1	103	·21 10.7	+79
	10	29 29.8	301 06.4	48.0	110 04.3	14.9	299 54.7	20.9	176 38.2	24.7	95 44.4	102	21 02.8	+80
	11	44 32.3	316 05.5	48.1	125 06.7	15.0	314 56.6	20.9	191 40.8	24.6	110 13.6	103	20 54.8	+81
	12	59 34.8	331 04.7	+24 48.2	140 09.1	−25 15.2	329 58.5	+23 20.9	206 43.4	−10 24.6	124 42.9	103	−20 46.7	+82
	13	74 37.2	346 03.8	48.3	155 11.5	15.3	345 00.4	21.0	221 46.0	24.5	139 12.2	104	20 38.5	+84
	14	89 39.7	1 03.0	48.4	170 13.9	15.5	0 02.3	21.0	236 48.7	24.5	153 41.6	104	20 30.1	+84
	15	104 42.2	16 02.1	·· 48.6	185 16.4	·· 15.6	15 04.1	·· 21.0	251 51.3	·· 24.4	168 11.0	104	·20 21.7	+85
	16	119 44.6	31 01.2	48.7	200 18.8	15.8	30 06.0	21.0	266 53.9	24.4	182 40.4	104	20 13.2	+87
	17	134 47.1	46 00.4	48.8	215 21.2	16.0	45 07.9	21.0	281 56.5	24.3	197 09.8	105	20 04.5	+88
	18	149 49.5	60 59.5	+24 48.9	230 23.6	−25 16.1	60 09.8	+23 21.0	296 59.1	−10 24.3	211 39.3	106	−19 55.7	+89
	19	164 52.0	75 58.7	49.0	245 26.1	16.3	75 11.7	21.0	312 01.7	24.2	226 08.9	105	19 46.8	+89
	20	179 54.5	90 57.8	49.1	260 28.5	16.4	90 13.5	21.0	327 04.4	24.2	240 38.4	106	19 37.9	+91
	21	194 56.9	105 57.0	·· 49.2	275 30.9	·· 16.6	105 15.4	·· 21.0	342 07.0	·· 24.1	255 08.0	107	·19 28.8	+92
	22	209 59.4	120 56.1	49.3	290 33.3	16.7	120 17.3	21.0	357 09.6	24.1	269 37.7	106	19 19.6	+93
	23	225 01.9	135 55.2	49.4	305 35.8	16.9	135 19.2	21.0	12 12.2	24.0	284 07.3	107	19 10.3	+94
23	0	240 04.3	150 54.4	+24 49.5	320 38.2	−25 17.1	150 21.1	+23 21.0	27 14.8	−10 24.0	298 37.0	108	−19 00.9	+95
	1	255 06.8	165 53.5	49.6	335 40.6	17.2	165 23.0	21.0	42 17.4	24.0	313 06.8	107	18 51.4	+97
	2	270 09.3	180 52.7	49.7	350 43.1	17.4	180 24.8	21.0	57 20.1	23.9	327 36.5	109	18 41.7	+97
	3	285 11.7	195 51.8	·· 49.8	5 45.5	·· 17.5	195 26.7	·· 21.0	72 22.7	·· 23.9	342 06.4	108	·18 32.0	+98
	4	300 14.2	210 51.0	49.9	20 48.0	17.7	210 28.6	21.0	87 25.3	23.8	356 36.2	109	18 22.2	+99
	5	315 16.7	225 50.1	50.0	35 50.4	17.8	225 30.5	21.0	102 27.9	23.8	11 06.1	109	18 12.3	+100
	6	330 19.1	240 49.2	+24 50.1	50 52.8	−25 18.0	240 32.4	+23 21.0	117 30.5	−10 23.7	25 36.0	109	−18 02.3	+102
	7	345 21.6	255 48.4	50.2	65 55.3	18.2	255 34.3	21.1	132 33.1	23.7	40 05.9	110	17 52.1	+102
	8	0 24.0	270 47.5	50.3	80 57.7	18.3	270 36.1	21.1	147 35.8	23.6	54 35.9	110	17 41.9	+103
	9	15 26.5	285 46.7	·· 50.4	96 00.2	·· 18.5	285 38.0	·· 21.1	162 38.4	·· 23.6	69 05.9	111	·17 31.6	+104
	10	30 29.0	300 45.8	50.5	111 02.6	18.6	300 39.9	21.1	177 41.0	23.5	83 36.0	111	17 21.2	+105
	11	45 31.4	315 45.0	50.5	126 05.1	18.8	315 41.8	21.1	192 43.6	23.5	98 06.1	111	17 10.7	+106
	12	60 33.9	330 44.1	+24 50.6	141 07.5	−25 19.0	330 43.7	+23 21.1	207 46.2	−10 23.4	112 36.2	111	−17 00.1	+107
	13	75 36.4	345 43.2	50.7	156 10.0	19.1	345 45.5	21.1	222 48.8	23.4	127 06.3	112	16 49.4	+108
	14	90 38.8	0 42.4	50.8	171 12.4	19.3	0 47.4	21.1	237 51.5	23.4	141 36.5	112	16 38.6	+109
	15	105 41.3	15 41.5	·· 50.9	186 14.9	·· 19.4	15 49.3	·· 21.1	252 54.1	·· 23.3	156 06.7	113	·16 27.7	+110
	16	120 43.8	30 40.7	51.0	201 17.3	19.6	30 51.2	21.1	267 56.7	23.3	170 37.0	113	16 16.7	+110
	17	135 46.2	45 39.8	51.0	216 19.8	19.7	45 53.1	21.1	282 59.3	23.2	185 07.3	113	16 05.7	+112
	18	150 48.7	60 39.0	+24 51.1	231 22.3	−25 19.9	60 54.9	+23 21.1	298 01.9	−10 23.2	199 37.6	113	−15 54.5	+113
	19	165 51.1	75 38.1	51.2	246 24.7	20.1	75 56.8	21.1	313 04.5	23.1	214 07.9	114	15 43.2	+113
	20	180 53.6	90 37.2	51.3	261 27.2	20.2	90 58.7	21.1	328 07.2	23.1	228 38.3	114	15 31.9	+114
	21	195 56.1	105 36.4	·· 51.3	276 29.6	·· 20.4	106 00.6	·· 21.1	343 09.8	·· 23.0	243 08.7	114	·15 20.5	+115
	22	210 58.5	120 35.5	51.4	291 32.1	20.6	121 02.5	21.1	358 12.4	23.0	257 39.1	115	15 09.0	+116
	23	226 01.0	135 34.7	51.5	306 34.6	20.7	136 04.3	21.1	13 15.0	22.9	272 09.6	115	14 57.4	+117
24	0	241 03.5	150 33.8	+24 51.6	321 37.0	−25 20.9	151 06.2	+23 21.1	28 17.6	−10 22.9	286 40.1	115	−14 45.7	+118
	1	256 05.9	165 33.0	51.6	336 39.5	21.0	166 08.1	21.1	43 20.2	22.8	301 10.6	115	14 33.9	+118
	2	271 08.4	180 32.1	51.7	351 42.0	21.2	181 10.0	21.1	58 22.8	22.8	315 41.1	116	14 22.1	+119
	3	286 10.9	195 31.3	·· 51.8	6 44.5	·· 21.4	196 11.9	·· 21.1	73 25.5	·· 22.8	330 11.7	116	·14 10.2	+121
	4	301 13.3	210 30.4	51.8	21 46.9	21.5	211 13.8	21.2	88 28.1	22.7	344 42.3	116	13 58.1	+120
	5	316 15.8	225 29.5	51.9	36 49.4	21.7	226 15.6	21.2	103 30.7	22.7	359 12.9	117	13 46.1	+122
	6	331 18.3	240 28.7	+24 52.0	51 51.9	−25 21.8	241 17.5	+23 21.2	118 33.3	−10 22.6	13 43.6	117	−13 33.9	+123
	7	346 20.7	255 27.8	52.0	66 54.4	22.0	256 19.4	21.2	133 35.9	22.6	28 14.3	117	13 21.6	+123
	8	1 23.2	270 27.0	52.1	81 56.8	22.2	271 21.3	21.2	148 38.5	22.5	42 45.0	117	13 09.3	+124
	9	16 25.6	285 26.1	·· 52.2	96 59.3	·· 22.3	286 23.2	·· 21.2	163 41.1	·· 22.5	57 15.7	117	·12 56.9	+125
	10	31 28.1	300 25.3	52.2	112 01.8	22.5	301 25.0	21.2	178 43.8	22.4	71 46.4	118	12 44.4	+125
	11	46 30.6	315 24.4	52.3	127 04.3	22.7	316 26.9	21.2	193 46.4	22.4	86 17.2	118	12 31.9	+127
	12	61 33.0	330 23.5	+24 52.3	142 06.8	−25 22.8	331 28.8	+23 21.2	208 49.0	−10 22.3	100 48.0	118	−12 19.2	+127
	13	76 35.5	345 22.7	52.4	157 09.3	23.0	346 30.7	21.2	223 51.6	22.3	115 18.8	118	12 06.5	+127
	14	91 38.0	0 21.8	52.4	172 11.7	23.1	1 32.5	21.2	238 54.2	22.3	129 49.6	119	11 53.8	+129
	15	106 40.4	15 21.0	·· 52.5	187 14.2	·· 23.3	16 34.4	·· 21.2	253 56.8	·· 22.2	144 20.5	119	·11 40.9	+129
	16	121 42.9	30 20.1	52.5	202 16.7	23.5	31 36.3	21.2	268 59.4	22.2	158 51.4	118	11 28.0	+130
	17	136 45.4	45 19.3	52.6	217 19.2	23.6	46 38.2	21.2	284 02.1	22.1	173 22.2	119	11 15.0	+130
	18	151 47.8	60 18.4	+24 52.6	232 21.7	−25 23.8	61 40.1	+23 21.2	299 04.7	−10 22.1	187 53.1	120	−11 02.0	+132
	19	166 50.3	75 17.5	52.7	247 24.2	24.0	76 41.9	21.2	314 07.3	22.0	202 24.1	119	10 48.8	+132
	20	181 52.8	90 16.7	52.7	262 26.7	24.1	91 43.8	21.2	329 09.9	22.0	216 55.0	119	10 35.6	+132
	21	196 55.2	105 15.8	·· 52.8	277 29.2	·· 24.3	106 45.7	·· 21.2	344 12.5	·· 21.9	231 25.9	120	·10 22.4	+133
	22	211 57.7	120 15.0	52.8	292 31.7	24.5	121 47.6	21.2	359 15.1	21.9	245 56.9	120	10 09.1	+134
	23	227 00.1	135 14.1	52.9	307 34.2	24.6	136 49.5	21.2	14 17.7	21.9	260 27.9	120	9 55.7	+134
	24	242 02.6	150 13.3	+24 52.9	322 36.7	−25 24.8	151 51.3	+23 21.2	29 20.3	−10 21.8	274 58.9	120	− 9 42.3	+135
	code	—	− 9	+ 1	+ 25	− 1	+ 18	0	+ 26	0				

GMT		SUN GHA	SUN Dec
	h	° ′	° ′
22	0	180 53.1	+20 14.0
	1	195 53.0	14.5
	2	210 53.0	15.0
	3	225 53.0 ··	15.5
	4	240 52.9	16.0
	5	255 52.9	16.5
	6	270 52.8	+20 17.0
	7	285 52.8	17.5
	8	300 52.7	18.0
	9	315 52.7 ··	18.5
	10	330 52.7	19.0
	11	345 52.6	19.5
	12	0 52.6	+20 20.0
	13	15 52.5	20.5
	14	30 52.5	21.0
	15	45 52.4 ··	21.5
	16	60 52.4	22.0
	17	75 52.4	22.5
	18	90 52.3	+20 23.0
	19	105 52.3	23.5
	20	120 52.2	24.0
	21	135 52.2 ··	24.5
	22	150 52.1	25.0
	23	165 52.1	25.5
23	0	180 52.0	+20 25.9
	1	195 52.0	26.4
	2	210 51.9	26.9
	3	225 51.9 ··	27.4
	4	240 51.9	27.9
	5	255 51.8	28.4
	6	270 51.8	+20 28.9
	7	285 51.7	29.4
	8	300 51.7	29.8
	9	315 51.6 ··	30.3
	10	330 51.6	30.8
	11	345 51.5	31.3
	12	0 51.5	+20 31.8
	13	15 51.4	32.3
	14	30 51.4	32.7
	15	45 51.3 ··	33.2
	16	60 51.3	33.7
	17	75 51.2	34.2
	18	90 51.2	+20 34.7
	19	105 51.1	35.1
	20	120 51.1	35.6
	21	135 51.0 ··	36.1
	22	150 51.0	36.6
	23	165 50.9	37.0
24	0	180 50.9	+20 37.5
	1	195 50.8	38.0
	2	210 50.8	38.5
	3	225 50.7 ··	38.9
	4	240 50.6	39.4
	5	255 50.6	39.9
	6	270 50.5	+20 40.4
	7	285 50.5	40.8
	8	300 50.4	41.3
	9	315 50.4 ··	41.8
	10	330 50.3	42.2
	11	345 50.3	42.7
	12	0 50.2	+20 43.2
	13	15 50.2	43.6
	14	30 50.1	44.1
	15	45 50.1 ··	44.6
	16	60 50.0	45.0
	17	75 49.9	45.5
	18	90 49.9	+20 46.0
	19	105 49.8	46.4
	20	120 49.8	46.9
	21	135 49.7 ··	47.4
	22	150 49.7	47.8
	23	165 49.6	48.3
	24	180 49.5	+20 48.7
code		—	+ 5

No	Name	SHA	Dec
		° ′	° ′
7	Acamar	315 52.3	−40 29.1
5	Achernar	336 00.0	−57 27.8
30	Acrux	173 58.7	−62 51.2
19	Adhara	255 47.6	−28 54.7
10	Aldebaran	291 40.6	+16 25.2
32	Alioth	166 58.9	+56 12.5
34	Alkaid	153 33.2	+49 32.4
55	Al Na'ir	28 39.1	−47 10.7
15	Alnilam	276 31.6	− 1 13.8
25	Alphard	218 39.7	− 8 27.8
41	Alphecca	126 48.1	+26 51.9
1	Alpheratz	358 29.6	+28 50.2
51	Altair	62 51.2	+ 8 44.7
2	Ankaa	353 59.5	−42 33.0
42	Antares	113 20.3	−26 20.1
37	Arcturus	146 35.8	+19 25.0
43	Atria	109 01.4	−68 56.9
22	Avior	234 36.6	−59 22.0
13	Bellatrix	279 19.8	+ 6 18.6
16	Betelg'se	271 49.5	+ 7 24.0
17	Canopus	264 16.3	−52 40.3
12	Capella	281 40.4	+45 57.3
53	Deneb	50 01.5	+45 06.8
28	Denebola	183 18.6	+14 49.5
4	Diphda	349 40.5	−18 14.1
27	Dubhe	194 45.6	+62 00.0
14	Elnath	279 09.0	+28 34.3
47	Eltanin	91 06.2	+51 29.4
54	Enif	34 30.6	+ 9 39.8
56	Fomalhaut	16 12.8	−29 51.7
31	Gacrux	172 50.1	−56 51.9
29	Gienah	176 37.8	−17 17.6
35	Hadar	149 50.4	−60 09.5
6	Hamal	328 51.1	+23 14.8
48	Kaus Aust.	84 42.2	−34 24.5
40	Kochab	137 16.5	+74 20.5
57	Markab	14 22.5	+14 57.5
8	Menkar	315 01.7	+ 3 54.8
36	Menkent	148 59.6	−36 09.1
24	Miapl'dus	221 49.7	−69 32.1
9	Mirfak	309 44.4	+49 42.0
50	Nunki	76 52.9	−26 21.3
52	Peacock	54 28.5	−56 52.8
21	Pollux	244 22.0	+28 08.3
20	Procyon	245 46.3	+ 5 20.6
46	R'alhague	96 47.2	+12 35.4
26	Regulus	208 30.6	+12 11.4
11	Rigel	281 54.9	− 8 15.2
38	Rigil Kent.	140 51.9	−60 39.2
44	Sabik	103 03.0	−15 40.3
3	Schedar	350 31.6	+56 17.1
45	Shaula	97 21.7	−37 04.4
18	Sirius	259 13.0	−16 39.2
33	Spica	159 17.7	−10 55.6
23	Suhail	223 25.3	−43 15.2
49	Vega	81 08.6	+38 44.2
39	Zub'g'bi	137 54.2	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 22	Moonrise 23	Moonrise 24	Moonrise 25
N °	h m	h m	h m	h m	h m	h m
72	□	□	■	■	2 27	1 47
70	□	□	■	2 45	1 59	1 33
68	0 58	////	■	1 59	1 37	1 21
66	1 52	////	1 45	1 30	1 20	1 11
64	2 24	////	1 07	1 07	1 05	1 03
62	2 47	////	0 40	0 49	0 54	0 56
60	3 06	////	0 19	0 34	0 43	0 50
58	3 21	////	0 02	0 21	0 34	0 45
56	3 34	////	24 10	0 10	0 27	0 40
54	3 46	////	24 00	0 00	0 20	0 36
52	3 56	////	23 51	24 13	0 13	0 32
50	4 05	1 05	23 43	24 08	0 08	0 28
45	4 23	2 09	23 26	23 55	24 21	0 21
40	4 39	2 45	23 12	23 45	24 14	0 14
35	4 51	3 11	23 00	23 36	24 09	0 09
30	5 03	3 31	22 50	23 28	24 03	0 03
20	5 21	4 01	22 32	23 15	23 55	24 34
10	5 38	4 22	22 17	23 03	23 47	24 31
0	5 53	4 40	22 02	22 52	23 40	24 28
10	6 08	4 54	21 47	22 40	23 33	24 25
20	6 24	5 07	21 32	22 28	23 25	24 22
30	6 42	5 18	21 13	22 15	23 16	24 18
35	6 53	5 23	21 03	22 07	23 11	24 17
40	7 05	5 29	20 51	21 58	23 05	24 14
45	7 19	5 34	20 36	21 47	22 59	24 12
50	7 37	5 40	20 19	21 34	22 50	24 08
52	7 45	5 42	20 10	21 28	22 47	24 07
54	7 54	5 45	20 01	21 21	22 42	24 05
56	8 04	5 47	19 50	21 13	22 38	24 04
58	8 16	5 50	19 38	21 05	22 33	24 02
60	8 29	5 52	19 24	20 55	22 27	23 59
S						

Lat.	Sunset	Twlt. ends	Moonset 22	Moonset 23	Moonset 24	Moonset 25
N °	h m	h m	h m	h m	h m	h m
72	□	□	■	■	8 03	10 25
70	□	□	■	6 00	8 30	10 37
68	23 04	////	■	6 44	8 50	10 46
66	22 05	////	5 12	7 13	9 06	10 54
64	21 32	////	5 50	7 35	9 18	11 00
62	21 08	////	6 16	7 52	9 29	11 06
60	20 49	////	6 37	8 07	9 38	11 10
58	20 33	////	6 54	8 19	9 46	11 15
56	20 20	////	7 08	8 29	9 53	11 18
54	20 09	////	7 20	8 38	9 59	11 22
52	19 58	////	7 31	8 47	10 05	11 25
50	19 49	22 53	7 40	8 54	10 10	11 27
45	19 31	21 47	8 00	9 10	10 21	11 33
40	19 15	21 10	8 17	9 23	10 30	11 38
35	19 02	20 44	8 30	9 33	10 37	11 42
30	18 51	20 24	8 42	9 43	10 44	11 46
20	18 32	19 54	9 02	9 59	10 56	11 52
10	18 16	19 32	9 20	10 13	11 06	11 58
0	18 00	19 13	9 36	10 26	11 15	12 03
10	17 45	18 59	9 52	10 39	11 24	12 08
20	17 29	18 46	10 09	10 53	11 34	12 13
30	17 11	18 35	10 29	11 08	11 45	12 19
35	17 00	18 29	10 40	11 17	11 51	12 23
40	16 48	18 23	10 53	11 28	11 58	12 27
45	16 34	18 18	11 08	11 40	12 07	12 31
50	16 17	18 12	11 27	11 54	12 17	12 36
52	16 08	18 09	11 36	12 01	12 21	12 39
54	15 59	18 07	11 46	12 08	12 26	12 41
56	15 49	18 04	11 57	12 17	12 32	12 44
58	15 37	18 01	12 10	12 26	12 38	12 47
60	15 24	17 59	12 24	12 37	12 45	12 51
S						

Equation of Time (App — Mean)

GMT	22	23	24
h	m s	m s	m s
0	+ 3 32.4	+ 3 28.3	+ 3 23.5
6	+ 3 31.4	+ 3 27.1	+ 3 22.3
12	+ 3 30.4	+ 3 26.0	+ 3 21.0
18	+ 3 29.3	+ 3 24.8	+ 3 19.7
24	+ 3 28.3	+ 3 23.5	+ 3 18.3

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
22	3 23	13 56	2 41	14 00	22 11
23	4 14	13 57	2 37	13 57	22 07
24	5 03	13 59	2 33	13 54	22 03
25	5 51	14 00	2 29	13 51	21 59

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.1	0.1	0.3
30			
	0.1	0.1	0.2
45			
	0.1	0.1	0.2
60			
	0.1	0.0	0.1
75			
	0.1	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	22	23	24
°	′	′	′
0			
	14.7	15.4	16.3
4			
	14.7	15.4	16.3
8			
	14.7	15.4	16.3
12			
	14.7	15.4	16.3
16			
	14.7	15.4	16.3
20			
	14.7	15.4	16.3
24			
	14.7	15.4	16.3
28			
	14.8	15.4	16.2
32			
	14.8	15.4	16.2
36			
	14.8	15.4	16.2
40			
	14.8	15.4	16.2
44			
	14.9	15.5	16.1
48			
	14.9	15.5	16.1
52			
	14.9	15.5	16.1
56			
	15.0	15.5	16.0
60			
	15.0	15.5	16.0
64			
	15.1	15.5	16.0
68			
	15.1	15.5	15.9
72			
	15.2	15.5	15.9
76			
	15.2	15.5	15.8
80			
	15.3	15.5	15.8
84			
	15.3	15.5	15.8
88			
	15.3	15.5	15.7
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	22	23	24
°	′	′	′
0			
	16.1	15.6	15.1
4			
	16.1	15.6	15.1
8			
	16.0	15.6	15.1
12			
	16.0	15.6	15.1
16			
	16.0	15.6	15.1
20			
	16.0	15.6	15.2
24			
	16.0	15.6	15.2
28			
	16.0	15.6	15.2
32			
	15.9	15.6	15.2
36			
	15.9	15.6	15.2
40			
	15.9	15.6	15.3
44			
	15.8	15.6	15.3
48			
	15.8	15.6	15.3
52			
	15.8	15.6	15.4
56			
	15.7	15.6	15.4
60			
	15.7	15.6	15.4
64			
	15.6	15.6	15.5
68			
	15.6	15.6	15.5
72			
	15.6	15.6	15.5
76			
	15.5	15.5	15.6
80			
	15.5	15.5	15.6
84			
	15.4	15.5	15.7
88			
	15.4	15.5	15.7
90			

Subtract from table, back cover

Rogation Sunday 23

GMT	♈ GHA	VENUS −3.4 GHA	Dec.	MARS −1.4 GHA	Dec.	JUPITER −1.5 GHA	Dec.	SATURN 0.5 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
25 0	242 02.6	150 13.3	+24 52.9	322 36.7	−25 24.8	151 51.3	+23 21.2	29 20.3	−10 21.8	274 58.9	120	− 9 42.3	+135
1	257 05.1	165 12.4	52.9	337 39.2	24.9	166 53.2	21.2	44 23.0	21.8	289 29.9	120	9 28.8	+136
2	272 07.5	180 11.6	53.0	352 41.7	25.1	181 55.1	21.2	59 25.6	21.7	304 00.9	120	9 15.2	+136
3	287 10.0	195 10.7	·· 53.0	7 44.2	·· 25.3	196 57.0	·· 21.2	74 28.2	·· 21.7	318 31.9	120	· 9 01.6	+137
4	302 12.5	210 09.8	53.1	22 46.7	25.4	211 58.8	21.2	89 30.8	21.6	333 02.9	120	8 47.9	+138
5	317 14.9	225 09.0	53.1	37 49.2	25.6	227 00.7	21.3	104 33.4	21.6	347 33.9	121	8 34.1	+137
6	332 17.4	240 08.1	+24 53.1	52 51.7	−25 25.8	242 02.6	+23 21.3	119 36.0	−10 21.5	2 05.0	120	− 8 20.4	+139
7	347 19.9	255 07.3	53.2	67 54.3	25.9	257 04.5	21.3	134 38.6	21.5	16 36.0	121	8 06.5	+139
8	2 22.3	270 06.4	53.2	82 56.8	26.1	272 06.4	21.3	149 41.2	21.4	31 07.1	120	7 52.6	+140
9	17 24.8	285 05.6	·· 53.2	97 59.3	·· 26.3	287 08.2	·· 21.3	164 43.8	·· 21.4	45 38.1	121	· 7 38.6	+140
10	32 27.3	300 04.7	53.2	113 01.8	26.4	302 10.1	21.3	179 46.5	21.4	60 09.2	120	7 24.6	+140
11	47 29.7	315 03.9	53.3	128 04.3	26.6	317 12.0	21.3	194 49.1	21.3	74 40.2	121	7 10.6	+141
12	62 32.2	330 03.0	+24 53.3	143 06.8	−25 26.8	332 13.9	+23 21.3	209 51.7	−10 21.3	89 11.3	121	− 6 56.5	+142
13	77 34.6	345 02.1	53.3	158 09.4	26.9	347 15.7	21.3	224 54.3	21.2	103 42.4	120	6 42.3	+142
14	92 37.1	0 01.3	53.4	173 11.9	27.1	2 17.6	21.3	239 56.9	21.2	118 13.4	121	6 28.1	+142
15	107 39.6	15 00.4	·· 53.4	188 14.4	·· 27.3	17 19.5	·· 21.3	254 59.5	·· 21.1	132 44.5	120	· 6 13.9	+143
16	122 42.0	29 59.6	53.4	203 16.9	27.4	32 21.4	21.3	270 02.1	21.1	147 15.5	121	5 59.6	+144
17	137 44.5	44 58.7	53.4	218 19.5	27.6	47 23.2	21.3	285 04.7	21.1	161 46.6	120	5 45.2	+144
18	152 47.0	59 57.9	+24 53.4	233 22.0	−25 27.8	62 25.1	+23 21.3	300 07.3	−10 21.0	176 17.6	120	− 5 30.8	+144
19	167 49.4	74 57.0	53.5	248 24.5	27.9	77 27.0	21.3	315 10.0	21.0	190 48.6	121	5 16.4	+145
20	182 51.9	89 56.2	53.5	263 27.1	28.1	92 28.9	21.3	330 12.6	20.9	205 19.7	120	5 01.9	+145
21	197 54.4	104 55.3	·· 53.5	278 29.6	·· 28.3	107 30.8	·· 21.3	345 15.2	·· 20.9	219 50.7	120	· 4 47.4	+145
22	212 56.8	119 54.4	53.5	293 32.1	28.4	122 32.6	21.3	0 17.8	20.8	234 21.7	120	4 32.9	+146
23	227 59.3	134 53.6	53.5	308 34.7	28.6	137 34.5	21.3	15 20.4	20.8	248 52.7	120	4 18.3	+146
26 0	243 01.7	149 52.7	+24 53.5	323 37.2	−25 28.8	152 36.4	+23 21.3	30 23.0	−10 20.7	263 23.7	119	− 4 03.7	+147
1	258 04.2	164 51.9	53.5	338 39.7	29.0	167 38.3	21.3	45 25.6	20.7	277 54.6	120	3 49.0	+147
2	273 06.7	179 51.0	53.5	353 42.3	29.1	182 40.1	21.3	60 28.2	20.7	292 25.6	119	3 34.3	+147
3	288 09.1	194 50.2	·· 53.5	8 44.8	·· 29.3	197 42.0	·· 21.3	75 30.8	·· 20.6	306 56.5	120	· 3 19.6	+148
4	303 11.6	209 49.3	53.6	23 47.4	29.5	212 43.9	21.3	90 33.5	20.6	321 27.5	119	3 04.8	+147
5	318 14.1	224 48.5	53.6	38 49.9	29.6	227 45.8	21.3	105 36.1	20.5	335 58.4	118	2 50.1	+149
6	333 16.5	239 47.6	+24 53.6	53 52.4	−25 29.8	242 47.6	+23 21.3	120 38.7	−10 20.5	350 29.2	119	− 2 35.2	+148
7	348 19.0	254 46.8	53.6	68 55.0	30.0	257 49.5	21.3	135 41.3	20.4	5 00.1	119	2 20.4	+149
8	3 21.5	269 45.9	53.6	83 57.5	30.1	272 51.4	21.3	150 43.9	20.4	19 31.0	118	2 05.5	+149
9	18 23.9	284 45.1	·· 53.6	99 00.1	·· 30.3	287 53.3	·· 21.3	165 46.5	·· 20.4	34 01.8	118	· 1 50.6	+149
10	33 26.4	299 44.2	53.6	114 02.6	30.5	302 55.1	21.3	180 49.1	20.3	48 32.6	118	1 35.7	+149
11	48 28.9	314 43.3	53.6	129 05.2	30.7	317 57.0	21.3	195 51.7	20.3	63 03.4	117	1 20.8	+150
12	63 31.3	329 42.5	+24 53.6	144 07.8	−25 30.8	332 58.9	+23 21.3	210 54.3	−10 20.2	77 34.1	118	− 1 05.8	+150
13	78 33.8	344 41.6	53.6	159 10.3	31.0	348 00.8	21.3	225 56.9	20.2	92 04.9	117	0 50.8	+150
14	93 36.2	359 40.8	53.6	174 12.9	31.2	3 02.6	21.3	240 59.5	20.1	106 35.6	116	0 35.8	+150
15	108 38.7	14 39.9	·· 53.5	189 15.4	·· 31.3	18 04.5	·· 21.3	256 02.1	·· 20.1	121 06.2	117	· 0 20.8	+150
16	123 41.2	29 39.1	53.5	204 18.0	31.5	33 06.4	21.3	271 04.8	20.0	135 36.9	116	− 0 05.8	+151
17	138 43.6	44 38.2	53.5	219 20.6	31.7	48 08.3	21.4	286 07.4	20.0	150 07.5	115	+ 0 09.3	+151
18	153 46.1	59 37.4	+24 53.5	234 23.1	−25 31.8	63 10.1	+23 21.4	301 10.0	−10 20.0	164 38.0	116	+ 0 24.4	+150
19	168 48.6	74 36.5	53.5	249 25.7	32.0	78 12.0	21.4	316 12.6	19.9	179 08.6	115	0 39.4	+151
20	183 51.0	89 35.7	53.5	264 28.2	32.2	93 13.9	21.4	331 15.2	19.9	193 39.1	115	0 54.5	+151
21	198 53.5	104 34.8	·· 53.5	279 30.8	·· 32.4	108 15.8	·· 21.4	346 17.8	·· 19.8	208 09.6	114	· 1 09.6	+152
22	213 56.0	119 34.0	53.5	294 33.4	32.5	123 17.6	21.4	1 20.4	19.8	222 40.0	114	1 24.8	+151
23	228 58.4	134 33.1	53.4	309 36.0	32.7	138 19.5	21.4	16 23.0	19.7	237 10.4	113	1 39.9	+151
27 0	244 00.9	149 32.3	+24 53.4	324 38.5	−25 32.9	153 21.4	+23 21.4	31 25.6	−10 19.7	251 40.7	114	+ 1 55.0	+151
1	259 03.3	164 31.4	53.4	339 41.1	33.0	168 23.3	21.4	46 28.2	19.7	266 11.1	112	2 10.1	+152
2	274 05.8	179 30.6	53.4	354 43.7	33.2	183 25.1	21.4	61 30.8	19.6	280 41.3	113	2 25.3	+151
3	289 08.3	194 29.7	·· 53.4	9 46.3	·· 33.4	198 27.0	·· 21.4	76 33.4	·· 19.6	295 11.6	111	· 2 40.4	+151
4	304 10.7	209 28.8	53.3	24 48.8	33.6	213 28.9	21.4	91 36.1	19.5	309 41.7	112	2 55.5	+152
5	319 13.2	224 28.0	53.3	39 51.4	33.7	228 30.8	21.4	106 38.7	19.5	324 11.9	111	3 10.7	+151
6	334 15.7	239 27.1	+24 53.3	54 54.0	−25 33.9	243 32.6	+23 21.4	121 41.3	−10 19.4	338 42.0	110	+ 3 25.8	+151
7	349 18.1	254 26.3	53.3	69 56.6	34.1	258 34.5	21.4	136 43.9	19.4	353 12.0	110	3 40.9	+152
8	4 20.6	269 25.4	53.2	84 59.2	34.3	273 36.4	21.4	151 46.5	19.4	7 42.0	110	3 56.1	+151
9	19 23.1	284 24.6	·· 53.2	100 01.7	·· 34.4	288 38.3	·· 21.4	166 49.1	·· 19.3	22 12.0	109	· 4 11.2	+151
10	34 25.5	299 23.7	53.2	115 04.3	34.6	303 40.1	21.4	181 51.7	19.3	36 41.9	108	4 26.3	+151
11	49 28.0	314 22.9	53.1	130 06.9	34.8	318 42.0	21.4	196 54.3	19.2	51 11.7	108	4 41.4	+151
12	64 30.5	329 22.0	+24 53.1	145 09.5	−25 35.0	333 43.9	+23 21.4	211 56.9	−10 19.2	65 41.5	107	+ 4 56.5	+150
13	79 32.9	344 21.2	53.1	160 12.1	35.1	348 45.8	21.4	226 59.5	19.2	80 11.2	107	5 11.5	+151
14	94 35.4	359 20.3	53.0	175 14.7	35.3	3 47.6	21.4	242 02.1	19.1	94 40.9	106	5 26.6	+150
15	109 37.8	14 19.5	·· 53.0	190 17.3	·· 35.5	18 49.5	·· 21.4	257 04.7	·· 19.1	109 10.5	106	· 5 41.6	+151
16	124 40.3	29 18.6	53.0	205 19.9	35.6	33 51.4	21.4	272 07.3	19.0	123 40.1	105	5 56.7	+150
17	139 42.8	44 17.8	52.9	220 22.5	35.8	48 53.3	21.4	287 09.9	19.0	138 09.6	104	6 11.7	+150
18	154 45.2	59 16.9	+24 52.9	235 25.1	−25 36.0	63 55.1	+23 21.4	302 12.5	−10 18.9	152 39.0	104	+ 6 26.7	+149
19	169 47.7	74 16.1	52.8	250 27.7	36.2	78 57.0	21.4	317 15.2	18.9	167 08.4	103	6 41.6	+150
20	184 50.2	89 15.2	52.8	265 30.3	36.3	93 58.9	21.4	332 17.8	18.9	181 37.7	103	6 56.6	+149
21	199 52.6	104 14.4	·· 52.7	280 32.9	·· 36.5	109 00.7	·· 21.4	347 20.4	·· 18.8	196 07.0	101	· 7 11.5	+149
22	214 55.1	119 13.5	52.7	295 35.5	36.7	124 02.6	21.4	2 23.0	18.8	210 36.1	102	7 26.4	+148
23	229 57.6	134 12.7	52.7	310 38.1	36.9	139 04.5	21.4	17 25.6	18.7	225 05.3	100	7 41.2	+148
24	245 00.0	149 11.8	+24 52.6	325 40.7	−25 37.1	154 06.4	+23 21.4	32 28.2	−10 18.7	239 34.3	100	+ 7 56.0	+148
code	—	− 9	0	+ 25	− 2	+ 19	0	+ 26	0				

GMT	SUN GHA	Dec.
h	° ′	° ′
25 0	180 49.5	+20 48.7
1	195 49.5	49.2
2	210 49.4	49.7
3	225 49.4 ••	50.1
4	240 49.3	50.6
5	255 49.3	51.0
6	270 49.2	+20 51.5
7	285 49.1	51.9
8	300 49.1	52.4
9	315 49.0 ••	52.9
10	330 49.0	53.3
11	345 48.9	53.8
12	0 48.8	+20 54.2
13	15 48.8	54.7
14	30 48.7	55.1
15	45 48.7 ••	55.6
16	60 48.6	56.0
17	75 48.5	56.5
18	90 48.5	+20 56.9
19	105 48.4	57.4
20	120 48.4	57.8
21	135 48.3 ••	58.3
22	150 48.2	58.7
23	165 48.2	59.2
26 0	180 48.1	+20 59.6
1	195 48.0	21 00.0
2	210 48.0	00.5
3	225 47.9 ••	00.9
4	240 47.8	01.4
5	255 47.8	01.8
6	270 47.7	+21 02.3
7	285 47.7	02.7
8	300 47.6	03.1
9	315 47.5 ••	03.6
10	330 47.5	04.0
11	345 47.4	04.5
12	0 47.3	+21 04.9
13	15 47.3	05.3
14	30 47.2	05.8
15	45 47.1 ••	06.2
16	60 47.1	06.6
17	75 47.0	07.1
18	90 46.9	+21 07.5
19	105 46.9	07.9
20	120 46.8	08.4
21	135 46.7 ••	08.8
22	150 46.7	09.2
23	165 46.6	09.7
27 0	180 46.5	+21 10.1
1	195 46.5	10.5
2	210 46.4	11.0
3	225 46.3 ••	11.4
4	240 46.3	11.8
5	255 46.2	12.2
6	270 46.1	+21 12.7
7	285 46.0	13.1
8	300 46.0	13.5
9	315 45.9 ••	14.0
10	330 45.8	14.4
11	345 45.8	14.8
12	0 45.7	+21 15.2
13	15 45.6	15.6
14	30 45.6	16.1
15	45 45.5 ••	16.5
16	60 45.4	16.9
17	75 45.3	17.3
18	90 45.3	+21 17.7
19	105 45.2	18.2
20	120 45.1	18.6
21	135 45.1 ••	19.0
22	150 45.0	19.4
23	165 44.9	19.8
24	180 44.8	+21 20.2
code	—	+ 4

STARS

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 52.2	−40 29.1
5	Achernar	336 00.0	−57 27.8
30	Acrux	173 58.7	−62 51.2
19	Adhara	255 47.6	−28 54.7
10	Aldebaran	291 40.6	+16 25.2
32	Alioth	166 59.0	+56 12.5
34	Alkaid	153 33.2	+49 32.4
55	Al Na'ir	28 39.1	−47 10.7
15	Alnilam	276 31.6	− 1 13.8
25	Alphard	218 39.7	− 8 27.8
41	Alphecca	126 48.1	+26 51.9
1	Alpheratz	358 29.6	+28 50.2
51	Altair	62 51.2	+ 8 44.7
2	Ankaa	353 59.4	−42 32.9
42	Antares	113 20.2	−26 20.1
37	Arcturus	146 35.8	+19 25.0
43	Atria	109 01.4	−68 56.9
22	Avior	234 36.6	−59 22.0
13	Bellatrix	279 19.8	+ 6 18.6
16	Betelg'se	271 49.5	+ 7 24.0
17	Canopus	264 16.3	−52 40.3
12	Capella	281 40.4	+45 57.3
53	Deneb	50 01.5	+45 06.8
28	Denebola	183 18.6	+14 49.5
4	Diphda	349 40.4	−18 14.1
27	Dubhe	194 45.6	+62 00.0
14	Elnath	279 09.0	+28 34.3
47	Eltanin	91 06.2	+51 29.4
54	Enif	34 30.5	+ 9 39.9
56	Fomalhaut	16 12.7	−29 51.7
31	Gacrux	172 50.2	−56 51.9
29	Gienah	176 37.8	−17 17.6
35	Hadar	149 50.4	−60 09.6
6	Hamal	328 51.1	+23 14.8
48	Kaus Aust.	84 42.2	−34 24.5
40	Kochab	137 16.6	+74 20.5
57	Markab	14 22.5	+14 57.5
8	Menkar	315 01.7	+ 3 54.8
36	Menkent	148 59.6	−36 09.1
24	Miapl'dus	221 49.7	−69 32.1
9	Mirfak	309 44.4	+49 42.0
50	Nunki	76 52.8	−26 21.3
52	Peacock	54 28.5	−56 52.8
21	Pollux	244 22.0	+28 08.3
20	Procyon	245 46.3	+ 5 20.6
46	R'alhague	96 47.2	+12 35.4
26	Regulus	208 30.6	+12 11.4
11	Rigel	281 54.9	− 8 15.2
38	Rigil Kent.	140 51.9	−60 39.2
44	Sabik	103 03.0	−15 40.3
3	Schedar	350 31.6	+56 17.1
45	Shaula	97 21.7	−37 04.4
18	Sirius	259 13.0	−16 39.2
33	Spica	159 17.7	−10 55.6
23	Suhail	223 25.3	−43 15.2
49	Vega	81 08.6	+38 44.2
39	Zub'g'bi	137 54.2	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 25	26	27	28
N °	h m	h m	h m	h m	h m	h m
72	▭	▭	1 47	1 17	0 51	{0 22 / 23 43}
70	▭	▭	1 33	1 12	0 53	0 33
68	0 26	////	1 21	1 08	0 55	0 42
66	1 39	////	1 11	1 04	0 57	0 50
64	2 15	////	1 03	1 01	0 59	0 57
62	2 40	////	0 56	0 58	1 00	1 02
60	3 00	////	0 50	0 56	1 01	1 07
58	3 16	////	0 45	0 54	1 03	1 12
56	3 30	////	0 40	0 52	1 04	1 16
54	3 42	////	0 36	0 50	1 04	1 20
52	3 52	////	0 32	0 49	1 05	1 23
50	4 01	0 51	0 28	0 47	1 06	1 26
45	4 21	2 04	0 21	0 44	1 08	1 32
40	4 37	2 41	0 14	0 42	1 09	1 38
35	4 50	3 08	0 09	0 39	1 10	1 42
30	5 01	3 29	0 03	0 37	1 11	1 47
20	5 21	3 59	24 34	0 34	1 13	1 54
10	5 38	4 22	24 31	0 31	1 15	2 01
0	5 53	4 39	24 28	0 28	1 16	2 07
10	6 09	4 55	24 25	0 25	1 18	2 13
20	6 25	5 08	24 22	0 22	1 20	2 20
30	6 44	5 20	24 18	0 18	1 22	2 27
35	6 55	5 25	24 17	0 17	1 23	2 32
40	7 07	5 32	24 14	0 14	1 25	2 37
45	7 22	5 37	24 12	0 12	1 26	2 43
50	7 40	5 43	24 08	0 08	1 28	2 50
52	7 48	5 45	24 07	0 07	1 29	2 54
54	7 58	5 49	24 05	0 05	1 30	2 57
56	8 09	5 51	24 04	0 04	1 31	3 02
58	8 21	5 54	24 02	0 02	1 32	3 06
60	8 35	5 57	23 59	25 34	1 34	3 11
S						

Lat.	Sunset	Twlt. ends	Moonset 25	26	27	28
N °	h m	h m	h m	h m	h m	h m
72	▭	▭	10 25	12 37	14 52	17 21
70	▭	▭	10 37	12 39	14 44	16 58
68	▭	▭	10 46	12 40	14 37	16 41
66	22 18	////	10 54	12 41	14 31	16 27
64	21 41	////	11 00	12 42	14 27	16 16
62	21 15	////	11 06	12 43	14 23	16 07
60	20 55	////	11 10	12 44	14 19	15 59
58	20 39	////	11 15	12 44	14 16	15 52
56	20 25	////	11 18	12 45	14 13	15 45
54	20 13	////	11 22	12 45	14 11	15 40
52	20 02	////	11 25	12 46	14 09	15 35
50	19 53	23 08	11 27	12 46	14 07	15 30
45	19 34	21 53	11 33	12 47	14 02	15 21
40	19 18	21 14	11 38	12 48	13 59	15 12
35	19 04	20 47	11 42	12 48	13 56	15 06
30	18 53	20 26	11 46	12 49	13 53	15 00
20	18 33	19 55	11 52	12 49	13 48	14 49
10	18 16	19 32	11 58	12 50	13 44	14 40
0	18 00	19 14	12 03	12 51	13 40	14 32
10	17 45	18 59	12 08	12 51	13 36	14 23
20	17 29	18 46	12 13	12 52	13 32	14 14
30	17 10	18 34	12 19	12 53	13 27	14 04
35	16 59	18 28	12 23	12 53	13 24	13 58
40	16 46	18 22	12 27	12 54	13 21	13 51
45	16 32	18 16	12 31	12 54	13 18	13 44
50	16 14	18 10	12 36	12 55	13 14	13 34
52	16 05	18 07	12 39	12 55	13 12	13 30
54	15 56	18 05	12 41	12 55	13 10	13 25
56	15 45	18 01	12 44	12 55	13 07	13 20
58	15 33	17 59	12 47	12 56	13 05	13 15
60	15 18	17 55	12 51	12 56	13 02	13 08
S						

GMT	Equation of Time (App.—Mean) 25	26	27
h	m s	m s	m s
0	+ 3 18.3	+ 3 12.5	+ 3 06.3
6	+ 3 16.9	+ 3 11.0	+ 3 04.6
12	+ 3 15.5	+ 3 09.5	+ 3 02.9
18	+ 3 14.0	+ 3 07.9	+ 3 01.2
24	+ 3 12.5	+ 3 06.3	+ 2 59.5

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
25	5 51	14 00	2 29	13 51	21 59
26	6 39	14 01	2 25	13 48	21 55
27	7 28	14 03	2 21	13 45	21 51
28	8 19	14 04	2 17	13 42	21 46

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.1	0.1	0.3
30			
	0.1	0.1	0.2
45			
	0.1	0.1	0.2
60			
	0.1	0.0	0.1
75			
	0.1	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	25	26	27
°	′	′	′
0			
	17.2	18.1	19.0
4			
	17.2	18.1	19.0
8			
	17.2	18.1	18.9
12			
	17.2	18.0	18.9
16			
	17.1	18.0	18.9
20			
	17.1	18.0	18.8
24			
	17.1	17.9	18.7
28			
	17.0	17.8	18.6
32			
	17.0	17.8	18.5
36			
	16.9	17.7	18.4
40			
	16.9	17.6	18.3
44			
	16.8	17.5	18.2
48			
	16.7	17.4	18.0
52			
	16.7	17.3	17.9
56			
	16.6	17.2	17.7
60			
	16.5	17.0	17.6
64			
	16.4	16.9	17.4
68			
	16.4	16.8	17.2
72			
	16.3	16.6	17.0
76			
	16.2	16.5	16.8
80			
	16.1	16.4	16.7
84			
	16.0	16.2	16.5
88			
	15.9	16.1	16.3
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	25	26	27
°	′	′	′
0			
	14.6	14.1	13.6
4			
	14.6	14.1	13.6
8			
	14.6	14.1	13.6
12			
	14.6	14.2	13.7
16			
	14.7	14.2	13.7
20			
	14.7	14.2	13.8
24			
	14.7	14.3	13.9
28			
	14.8	14.4	13.9
32			
	14.8	14.4	14.0
36			
	14.9	14.5	14.2
40			
	14.9	14.6	14.3
44			
	15.0	14.7	14.4
48			
	15.1	14.8	14.5
52			
	15.1	14.9	14.7
56			
	15.2	15.0	14.9
60			
	15.3	15.2	15.0
64			
	15.4	15.3	15.2
68			
	15.5	15.4	15.4
72			
	15.5	15.5	15.5
76			
	15.6	15.7	15.7
80			
	15.7	15.8	15.9
84			
	15.8	16.0	16.1
88			
	15.9	16.1	16.2
90			

Subtract from table, back cover

Last Quarter 25
Ascension Day 27

GMT	♈ GHA	VENUS −3.4 GHA	VENUS Dec.	MARS −1.6 GHA	MARS Dec.	JUPITER −1.5 GHA	JUPITER Dec.	SATURN 0.5 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
28 0	245 00.0	149 11.8	+24 52.6	325 40.7	−25 37.1	154 06.4	+23 21.4	32 28.2	−10 18.7	239 34.3	100	+ 7 56.0	+148
1	260 02.5	164 11.0	52.6	340 43.3	37.2	169 08.2	21.4	47 30.8	18.6	254 03.3	99	8 10.8	+148
2	275 05.0	179 10.1	52.5	355 45.9	37.4	184 10.1	21.4	62 33.4	18.6	268 32.2	99	8 25.6	+147
3	290 07.4	194 09.3	·· 52.5	10 48.5	·· 37.6	199 12.0	·· 21.4	77 36.0	·· 18.6	283 01.1	97	· 8 40.3	+147
4	305 09.9	209 08.4	52.4	25 51.2	37.8	214 13.9	21.4	92 38.6	18.5	297 29.8	97	8 55.0	+147
5	320 12.3	224 07.6	52.3	40 53.8	37.9	229 15.7	21.4	107 41.2	18.5	311 58.5	97	9 09.7	+146
6	335 14.8	239 06.7	+24 52.3	55 56.4	−25 38.1	244 17.6	+23 21.4	122 43.8	−10 18.4	326 27.2	95	+ 9 24.3	+145
7	350 17.3	254 05.9	52.2	70 59.0	38.3	259 19.5	21.4	137 46.4	18.4	340 55.7	95	9 38.8	+146
8	5 19.7	269 05.0	52.2	86 01.6	38.5	274 21.3	21.4	152 49.0	18.4	355 24.2	94	9 53.4	+144
9	20 22.2	284 04.2	·· 52.1	101 04.2	·· 38.6	289 23.2	·· 21.4	167 51.6	·· 18.3	9 52.6	93	·10 07.8	+145
10	35 24.7	299 03.3	52.1	116 06.9	38.8	304 25.1	21.4	182 54.2	18.3	24 20.9	93	10 22.3	+143
11	50 27.1	314 02.5	52.0	131 09.5	39.0	319 27.0	21.4	197 56.8	18.2	38 49.2	91	10 36.6	+144
12	65 29.6	329 01.6	+24 51.9	146 12.1	−25 39.2	334 28.8	+23 21.4	212 59.4	−10 18.2	53 17.3	91	+10 51.0	+142
13	80 32.1	344 00.8	51.9	161 14.7	39.3	349 30.7	21.4	228 02.0	18.2	67 45.4	90	11 05.2	+143
14	95 34.5	359 00.0	51.8	176 17.4	39.5	4 32.6	21.4	243 04.6	18.1	82 13.4	89	11 19.5	+141
15	110 37.0	13 59.1	·· 51.7	191 20.0	·· 39.7	19 34.4	·· 21.4	258 07.2	·· 18.1	96 41.3	89	·11 33.6	+141
16	125 39.4	28 58.3	51.7	206 22.6	39.9	34 36.3	21.4	273 09.8	18.0	111 09.2	87	11 47.7	+141
17	140 41.9	43 57.4	51.6	221 25.3	40.1	49 38.2	21.4	288 12.4	18.0	125 36.9	87	12 01.8	+140
18	155 44.4	58 56.6	+24 51.5	236 27.9	−25 40.2	64 40.1	+23 21.4	303 15.1	−10 17.9	140 04.6	86	+12 15.8	+139
19	170 46.8	73 55.7	51.5	251 30.5	40.4	79 41.9	21.4	318 17.7	17.9	154 32.2	85	12 29.7	+138
20	185 49.3	88 54.9	51.4	266 33.2	40.6	94 43.8	21.4	333 20.3	17.9	168 59.7	84	12 43.5	+138
21	200 51.8	103 54.0	·· 51.3	281 35.8	·· 40.8	109 45.7	·· 21.4	348 22.9	·· 17.8	183 27.1	84	·12 57.3	+137
22	215 54.2	118 53.2	51.2	296 38.5	40.9	124 47.5	21.4	3 25.5	17.8	197 54.5	82	13 11.0	+137
23	230 56.7	133 52.3	51.2	311 41.1	41.1	139 49.4	21.4	18 28.1	17.7	212 21.7	82	13 24.7	+135
29 0	245 59.2	148 51.5	+24 51.1	326 43.7	−25 41.3	154 51.3	+23 21.4	33 30.7	−10 17.7	226 48.9	80	+13 38.2	+135
1	261 01.6	163 50.6	51.0	341 46.4	41.5	169 53.2	21.4	48 33.3	17.7	241 15.9	80	13 51.7	+134
2	276 04.1	178 49.8	50.9	356 49.0	41.7	184 55.0	21.4	63 35.9	17.6	255 42.9	79	14 05.1	+134
3	291 06.6	193 48.9	·· 50.8	11 51.7	·· 41.8	199 56.9	·· 21.4	78 38.5	·· 17.6	270 09.8	78	·14 18.5	+132
4	306 09.0	208 48.1	50.7	26 54.3	42.0	214 58.8	21.4	93 41.1	17.5	284 36.6	77	14 31.7	+132
5	321 11.5	223 47.2	50.7	41 57.0	42.2	230 00.6	21.4	108 43.7	17.5	299 03.3	76	14 44.9	+131
6	336 13.9	238 46.4	+24 50.6	56 59.6	−25 42.4	245 02.5	+23 21.4	123 46.3	−10 17.5	313 29.9	75	+14 58.0	+130
7	351 16.4	253 45.6	50.5	72 02.3	42.6	260 04.4	21.4	138 48.9	17.4	327 56.4	75	15 11.0	+129
8	6 18.9	268 44.7	50.4	87 04.9	42.7	275 06.3	21.4	153 51.5	17.4	342 22.9	73	15 23.9	+128
9	21 21.3	283 43.9	·· 50.3	102 07.6	·· 42.9	290 08.1	·· 21.4	168 54.1	·· 17.3	356 49.2	73	·15 36.7	+128
10	36 23.8	298 43.0	50.2	117 10.3	43.1	305 10.0	21.4	183 56.7	17.3	11 15.5	71	15 49.5	+126
11	51 26.3	313 42.2	50.1	132 12.9	43.3	320 11.9	21.4	198 59.3	17.3	25 41.6	71	16 02.1	+125
12	66 28.7	328 41.3	+24 50.0	147 15.6	−25 43.5	335 13.7	+23 21.4	214 01.9	−10 17.2	40 07.7	69	+16 14.6	+125
13	81 31.2	343 40.5	49.9	162 18.2	43.6	350 15.6	21.4	229 04.5	17.2	54 33.6	69	16 27.1	+123
14	96 33.7	358 39.6	49.8	177 20.9	43.8	5 17.5	21.4	244 07.1	17.1	68 59.5	68	16 39.4	+122
15	111 36.1	13 38.8	·· 49.8	192 23.6	·· 44.0	20 19.3	·· 21.4	259 09.7	·· 17.1	83 25.3	67	·16 51.6	+122
16	126 38.6	28 38.0	49.7	207 26.2	44.2	35 21.2	21.4	274 12.3	17.1	97 51.0	66	17 03.8	+120
17	141 41.1	43 37.1	49.6	222 28.9	44.4	50 23.1	21.4	289 14.9	17.0	112 16.6	65	17 15.8	+119
18	156 43.5	58 36.3	+24 49.5	237 31.6	−25 44.6	65 25.0	+23 21.4	304 17.5	−10 17.0	126 42.1	64	+17 27.7	+118
19	171 46.0	73 35.4	49.4	252 34.2	44.7	80 26.8	21.4	319 20.1	16.9	141 07.5	63	17 39.5	+117
20	186 48.4	88 34.6	49.3	267 36.9	44.9	95 28.7	21.4	334 22.7	16.9	155 32.8	62	17 51.2	+116
21	201 50.9	103 33.7	·· 49.1	282 39.6	·· 45.1	110 30.6	·· 21.4	349 25.3	·· 16.9	169 58.0	61	·18 02.8	+115
22	216 53.4	118 32.9	49.0	297 42.3	45.3	125 32.4	21.4	4 27.9	16.8	184 23.1	61	18 14.3	+113
23	231 55.8	133 32.1	48.9	312 44.9	45.5	140 34.3	21.4	19 30.5	16.8	198 48.2	59	18 25.6	+113
30 0	246 58.3	148 31.2	+24 48.8	327 47.6	−25 45.6	155 36.2	+23 21.4	34 33.1	−10 16.7	213 13.1	58	+18 36.9	+111
1	262 00.8	163 30.4	48.7	342 50.3	45.8	170 38.0	21.4	49 35.7	16.7	227 37.9	58	18 48.0	+109
2	277 03.2	178 29.5	48.6	357 53.0	46.0	185 39.9	21.4	64 38.3	16.7	242 02.7	57	18 58.9	+109
3	292 05.7	193 28.7	·· 48.5	12 55.7	·· 46.2	200 41.8	·· 21.4	79 40.9	·· 16.6	256 27.4	55	·19 09.8	+107
4	307 08.2	208 27.9	48.4	27 58.4	46.4	215 43.7	21.4	94 43.5	16.6	270 51.9	55	19 20.5	+106
5	322 10.6	223 27.0	48.3	43 01.0	46.6	230 45.5	21.4	109 46.1	16.5	285 16.4	54	19 31.1	+105
6	337 13.1	238 26.2	+24 48.2	58 03.7	−25 46.7	245 47.4	+23 21.4	124 48.7	−10 16.5	299 40.8	53	+19 41.6	+103
7	352 15.6	253 25.3	48.0	73 06.4	46.9	260 49.3	21.4	139 51.3	16.5	314 05.1	52	19 51.9	+103
8	7 18.0	268 24.5	47.9	88 09.1	47.1	275 51.1	21.4	154 53.9	16.4	328 29.3	51	20 02.2	+100
9	22 20.5	283 23.6	·· 47.8	103 11.8	·· 47.3	290 53.0	·· 21.4	169 56.5	·· 16.4	342 53.4	51	·20 12.2	+100
10	37 22.9	298 22.8	47.7	118 14.5	47.5	305 54.9	21.4	184 59.1	16.3	357 17.5	49	20 22.2	+ 97
11	52 25.4	313 22.0	47.6	133 17.2	47.7	320 56.7	21.4	200 01.7	16.3	11 41.4	49	20 31.9	+ 97
12	67 27.9	328 21.1	+24 47.4	148 19.9	−25 47.8	335 58.6	+23 21.4	215 04.3	−10 16.3	26 05.3	48	+20 41.6	+ 95
13	82 30.3	343 20.3	47.3	163 22.6	48.0	351 00.5	21.4	230 06.9	16.2	40 29.1	47	20 51.1	+ 94
14	97 32.8	358 19.4	47.2	178 25.3	48.2	6 02.3	21.4	245 09.5	16.2	54 52.8	46	21 00.5	+ 92
15	112 35.3	13 18.6	·· 47.1	193 28.0	·· 48.4	21 04.2	·· 21.4	260 12.1	·· 16.2	69 16.4	45	·21 09.7	+ 90
16	127 37.7	28 17.8	46.9	208 30.7	48.6	36 06.1	21.4	275 14.7	16.1	83 39.9	45	21 18.7	+ 90
17	142 40.2	43 16.9	46.8	223 33.4	48.8	51 07.9	21.4	290 17.3	16.1	98 03.4	44	21 27.7	+ 87
18	157 42.7	58 16.1	+24 46.7	238 36.1	−25 48.9	66 09.8	+23 21.4	305 19.9	−10 16.0	112 26.8	43	+21 36.4	+ 86
19	172 45.1	73 15.3	46.5	253 38.8	49.1	81 11.7	21.4	320 22.5	16.0	126 50.1	42	21 45.0	+ 85
20	187 47.6	88 14.4	46.4	268 41.5	49.3	96 13.6	21.4	335 25.1	16.0	141 13.3	42	21 53.5	+ 83
21	202 50.1	103 13.6	·· 46.3	283 44.2	·· 49.5	111 15.4	·· 21.4	350 27.7	·· 15.9	155 36.5	40	·22 01.8	+ 82
22	217 52.5	118 12.7	46.1	298 46.9	49.7	126 17.3	21.4	5 30.3	15.9	169 59.5	40	22 10.0	+ 79
23	232 55.0	133 11.9	46.0	313 49.6	49.9	141 19.2	21.4	20 32.9	15.8	184 22.5	40	22 17.9	+ 79
24	247 57.4	148 11.1	+24 45.9	328 52.4	−25 50.1	156 21.0	+23 21.4	35 35.5	−10 15.8	198 45.5	38	+22 25.8	+ 76
code	—	− 8	− 1	+ 26	− 1	+ 19	0	+ 26	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
28 0	180 44.8	+21 20.2
1	195 44.8	20.7
2	210 44.7	21.1
3	225 44.6	•• 21.5
4	240 44.5	21.9
5	255 44.5	22.3
6	270 44.4	+21 22.7
7	285 44.3	23.1
8	300 44.2	23.5
9	315 44.2	•• 23.9
10	330 44.1	24.4
11	345 44.0	24.8
12	0 43.9	+21 25.2
13	15 43.9	25.6
14	30 43.8	26.0
15	45 43.7	•• 26.4
16	60 43.6	26.8
17	75 43.6	27.2
18	90 43.5	+21 27.6
19	105 43.4	28.0
20	120 43.3	28.4
21	135 43.2	•• 28.8
22	150 43.2	29.2
23	165 43.1	29.6
29 0	180 43.0	+21 30.0
1	195 42.9	30.4
2	210 42.8	30.8
3	225 42.8	•• 31.2
4	240 42.7	31.6
5	255 42.6	32.0
6	270 42.5	+21 32.4
7	285 42.5	32.8
8	300 42.4	33.2
9	315 42.3	•• 33.6
10	330 42.2	34.0
11	345 42.1	34.4
12	0 42.1	+21 34.8
13	15 42.0	35.1
14	30 41.9	35.5
15	45 41.8	•• 35.9
16	60 41.7	36.3
17	75 41.6	36.7
18	90 41.6	+21 37.1
19	105 41.5	37.5
20	120 41.4	37.9
21	135 41.3	•• 38.3
22	150 41.2	38.6
23	165 41.2	39.0
30 0	180 41.1	+21 39.4
1	195 41.0	39.8
2	210 40.9	40.2
3	225 40.8	•• 40.6
4	240 40.7	40.9
5	255 40.6	41.3
6	270 40.6	+21 41.7
7	285 40.5	42.1
8	300 40.4	42.5
9	315 40.3	•• 42.8
10	330 40.2	43.2
11	345 40.1	43.6
12	0 40.1	+21 44.0
13	15 40.0	44.3
14	30 39.9	44.7
15	45 39.8	•• 45.1
16	60 39.7	45.5
17	75 39.6	45.8
18	90 39.5	+21 46.2
19	105 39.5	46.6
20	120 39.4	47.0
21	135 39.3	•• 47.3
22	150 39.2	47.7
23	165 39.1	48.1
24	180 39.0	+21 48.4
code	–	+ 3

STARS

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 52.2	−40 29.0
5	Achernar	335 59.9	−57 27.8
30	Acrux	173 58.7	−62 51.2
19	Adhara	255 47.6	−28 54.7
10	Aldebaran	291 40.6	+16 25.2
32	Alioth	166 59.0	+56 12.5
34	Alkaid	153 33.2	+49 32.5
55	Al Na'ir	28 39.1	−47 10.7
15	Alnilam	276 31.6	− 1 13.8
25	Alphard	218 39.7	− 8 27.8
41	Alphecca	126 48.1	+26 51.9
1	Alpheratz	358 29.5	+28 50.2
51	Altair	62 51.2	+ 8 44.7
2	Ankaa	353 59.4	−42 32.9
42	Antares	113 20.2	−26 20.1
37	Arcturus	146 35.8	+19 25.1
43	Atria	109 01.3	−68 56.9
22	Avior	234 36.6	−59 22.0
13	Bellatrix	279 19.8	+ 6 18.6
16	Betelg'se	271 49.5	+ 7 24.0
17	Canopus	264 16.3	−52 40.3
12	Capella	281 40.4	+45 57.3
53	Deneb	50 01.5	+45 06.8
28	Denebola	183 18.6	+14 49.6
4	Diphda	349 40.4	−18 14.0
27	Dubhe	194 45.6	+62 00.0
14	Elnath	279 09.0	+28 34.3
47	Eltanin	91 06.2	+51 29.5
54	Enif	34 30.5	+ 9 39.9
56	Fomalhaut	16 12.7	−29 51.6
31	Gacrux	172 50.2	−56 51.9
29	Gienah	176 37.8	−17 17.6
35	Hadar	149 50.4	−60 09.6
6	Hamal	328 51.1	+23 14.8
48	Kaus Aust.	84 42.1	−34 24.5
40	Kochab	137 16.6	+74 20.5
57	Markab	14 22.5	+14 57.5
8	Menkar	315 01.7	+ 3 54.8
36	Menkent	148 59.6	−36 09.1
24	Miapl'dus	221 49.7	−69 32.1
9	Mirfak	309 44.4	+49 42.0
50	Nunki	76 52.8	−26 21.3
52	Peacock	54 28.5	−56 52.8
21	Pollux	244 22.1	+28 08.3
20	Procyon	245 46.3	+ 5 20.6
46	R'alhague	96 47.2	+12 35.4
26	Regulus	208 30.6	+12 11.4
11	Rigel	281 54.9	− 8 15.2
38	Rigil Kent.	140 51.9	−60 39.2
44	Sabik	103 03.0	−15 40.3
3	Schedar	350 31.5	+56 17.1
45	Shaula	97 21.6	−37 04.4
18	Sirius	259 13.0	−16 39.2
33	Spica	159 17.7	−10 55.6
23	Suhail	223 25.3	−43 15.2
49	Vega	81 08.6	+38 44.2
39	Zub'g'bi	137 54.2	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 28	Moonrise 29	Moonrise 30	Moonrise 31
N °	h m	h m	h m	h m	h m	h m
72	▭	▭	{0 22 / 23 43}	▭	▭	▭
70	▭	▭	0 33	{0 08 / 23 24}	▭	▭
68	▭	▭	0 42	0 27	0 05	▭
66	1 27	////	0 50	0 42	0 33	0 17
64	2 07	////	0 57	0 55	0 55	0 57
62	2 34	////	1 02	1 06	1 12	1 25
60	2 55	////	1 07	1 15	1 27	1 46
58	3 12	////	1 12	1 24	1 40	2 04
56	3 26	////	1 16	1 31	1 51	2 19
54	3 38	////	1 20	1 37	2 00	2 32
52	3 49	////	1 23	1 43	2 09	2 43
50	3 59	0 36	1 26	1 49	2 17	2 53
45	4 19	1 58	1 32	2 00	2 33	3 15
40	4 35	2 38	1 38	2 10	2 47	3 32
35	4 48	3 06	1 42	2 18	2 59	3 47
30	5 00	3 27	1 47	2 25	3 09	3 59
20	5 20	3 58	1 54	2 38	3 27	4 21
10	5 38	4 22	2 01	2 49	3 42	4 40
0	5 54	4 39	2 07	3 00	3 57	4 58
10	6 10	4 55	2 13	3 11	4 12	5 16
20	6 27	5 08	2 20	3 22	4 28	5 35
30	6 46	5 21	2 27	3 36	4 46	5 58
35	6 57	5 27	2 32	3 43	4 57	6 11
40	7 10	5 33	2 37	3 52	5 10	6 26
45	7 25	5 39	2 43	4 03	5 24	6 45
50	7 44	5 46	2 50	4 16	5 43	7 07
52	7 52	5 49	2 54	4 22	5 51	7 18
54	8 02	5 52	2 57	4 28	6 01	7 31
56	8 13	5 55	3 02	4 35	6 12	7 45
58	8 26	5 57	3 06	4 44	6 24	8 02
60 S	8 41	6 01	3 11	4 53	6 39	8 22

Lat.	Sunset	Twlt. ends	Moonset 28	Moonset 29	Moonset 30	Moonset 31
N °	h m	h m	h m	h m	h m	h m
72	▭	▭	17 21	▭	▭	▭
70	▭	▭	16 58	19 40	▭	▭
68	▭	▭	16 41	19 01	▭	▭
66	22 31	////	16 27	18 33	20 54	▭
64	21 50	////	16 16	18 13	20 15	22 15
62	21 22	////	16 07	17 56	19 48	21 33
60	21 01	////	15 59	17 42	19 27	21 04
58	20 44	////	15 52	17 31	19 10	20 42
56	20 30	////	15 45	17 20	18 56	20 24
54	20 17	////	15 40	17 11	18 43	20 09
52	20 06	////	15 35	17 04	18 33	19 56
50	19 57	23 27	15 30	16 56	18 23	19 44
45	19 36	21 57	15 21	16 41	18 03	19 20
40	19 20	21 18	15 12	16 29	17 46	19 01
35	19 06	20 50	15 06	16 18	17 32	18 45
30	18 55	20 29	15 00	16 09	17 20	18 31
20	18 34	19 56	14 49	15 53	17 00	18 07
10	18 17	19 34	14 40	15 39	16 42	17 47
0	18 01	19 15	14 32	15 27	16 26	17 28
10	17 45	19 00	14 23	15 14	16 09	17 09
20	17 28	18 46	14 14	15 00	15 52	16 49
30	17 09	18 33	14 04	14 45	15 31	16 25
35	16 58	18 27	13 58	14 36	15 20	16 11
40	16 45	18 21	13 51	14 26	15 06	15 55
45	16 30	18 15	13 44	14 14	14 50	15 37
50	16 11	18 08	13 34	13 59	14 31	15 13
52	16 02	18 05	13 30	13 53	14 22	15 02
54	15 52	18 02	13 25	13 45	14 12	14 49
56	15 41	17 59	13 20	13 37	14 00	14 34
58	15 29	17 56	13 15	13 28	13 47	14 17
60 S	15 14	17 53	13 08	13 17	13 31	13 56

Equation of Time (App.—Mean)

GMT	28	29	30
h	m s	m s	m s
0	+ 2 59.5	+ 2 52.2	+ 2 44.4
6	+ 2 57.7	+ 2 50.3	+ 2 42.4
12	+ 2 55.9	+ 2 48.4	+ 2 40.4
18	+ 2 54.1	+ 2 46.4	+ 2 38.3
24	+ 2 52.2	+ 2 44.4	+ 2 36.2

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
28	8 19	14 04	2 17	13 42	21 46
29	9 13	14 05	2 13	13 39	21 42
30	10 11	14 07	2 08	13 36	21 38
31	11 13	14 08	2 04	13 33	21 34

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
30	0.1	0.1	0.3
45	0.1	0.1	0.2
60	0.1	0.1	0.2
75	0.1	0.0	0.1
90	0.1	0.0	0.0

Moon's Lower Limb Add

Alt.	28	29	30
°	′	′	′
0	19.6	20.1	20.4
4	19.6	20.1	20.4
8	19.6	20.1	20.3
12	19.5	20.0	20.3
16	19.5	20.0	20.2
20	19.4	19.9	20.1
24	19.3	19.8	20.0
28	19.2	19.7	19.9
32	19.1	19.5	19.7
36	18.9	19.4	19.6
40	18.8	19.2	19.4
44	18.6	19.0	19.2
48	18.5	18.8	19.0
52	18.3	18.6	18.8
56	18.1	18.4	18.6
60	17.9	18.2	18.4
64	17.7	18.0	18.1
68	17.5	17.8	17.9
72	17.3	17.5	17.6
76	17.1	17.3	17.4
80	16.9	17.0	17.1
84	16.6	16.8	16.9
88	16.5	16.6	16.7
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	28	29	30
°	′	′	′
0	13.2	12.9	12.8
4	13.2	13.0	12.8
8	13.3	13.0	12.8
12	13.3	13.0	12.9
16	13.4	13.1	13.0
20	13.5	13.2	13.1
24	13.5	13.3	13.2
28	13.6	13.4	13.3
32	13.8	13.5	13.4
36	13.9	13.7	13.6
40	14.0	13.9	13.8
44	14.2	14.0	13.9
48	14.4	14.2	14.1
52	14.5	14.4	14.3
56	14.7	14.6	14.6
60	14.9	14.8	14.8
64	15.1	15.1	15.0
68	15.3	15.3	15.3
72	15.5	15.5	15.5
76	15.8	15.8	15.8
80	16.0	16.0	16.1
84	16.2	16.3	16.3
88	16.4	16.5	16.5
90			

Subtract from table, back cover

Memorial Day 30

GMT	♈ GHA	VENUS −3.4 GHA	VENUS Dec.	MARS −1.6 GHA	MARS Dec.	JUPITER −1.4 GHA	JUPITER Dec.	SATURN 0.5 GHA	SATURN Dec	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
31 0	247 57.4	148 11.1	+24 45.9	328 52.4	−25 50.1	156 21.0	+23 21.4	35 35.5	−10 15.8	198 45.5	38	+22 25.8	+76
1	262 59.9	163 10.2	45.7	343 55.1	50.2	171 22.9	21.4	50 38.1	15.8	213 08.3	38	22 33.4	+75
2	278 02.4	178 09.4	45.6	358 57.8	50.4	186 24.8	21.4	65 40.7	15.7	227 31.1	38	22 40.9	+74
3	293 04.8	193 08.6	·· 45.4	14 00.5	·· 50.6	201 26.6	·· 21.4	80 43.3	·· 15.7	241 53.9	36	·22 48.3	+71
4	308 07.3	208 07.7	45.3	29 03.2	50.8	216 28.5	21.4	95 45.8	15.6	256 16.5	37	22 55.4	+70
5	323 09.8	223 06.9	45.2	44 06.0	51.0	231 30.4	21.4	110 48.4	15.6	270 39.2	35	23 02.4	+69
6	338 12.2	238 06.0	+24 45.0	59 08.7	−25 51.2	246 32.2	+23 21.4	125 51.0	−10 15.6	285 01.7	35	+23 09.3	+66
7	353 14.7	253 05.2	44.9	74 11.4	51.3	261 34.1	21.4	140 53.6	15.5	299 24.2	34	23 15.9	+66
8	8 17.2	268 04.4	44.7	89 14.1	51.5	276 36.0	21.3	155 56.2	15.5	313 46.6	34	23 22.4	+64
9	23 19.6	283 03.5	·· 44.6	104 16.9	·· 51.7	291 37.8	·· 21.3	170 58.8	·· 15.5	328 09.0	33	·23 28.8	+61
10	38 22.1	298 02.7	44.4	119 19.6	51.9	306 39.7	21.3	186 01.4	15.4	342 31.3	33	23 34.9	+60
11	53 24.5	313 01.9	44.3	134 22.3	52.1	321 41.6	21.3	201 04.0	15.4	356 53.6	33	23 40.9	+58
12	68 27.0	328 01.0	+24 44.1	149 25.0	−25 52.3	336 43.4	+23 21.3	216 06.6	−10 15.3	11 15.9	31	+23 46.7	+56
13	83 29.5	343 00.2	44.0	164 27.8	52.5	351 45.3	21.3	231 09.2	15.3	25 38.0	32	23 52.3	+55
14	98 31.9	357 59.4	43.8	179 30.5	52.7	6 47.2	21.3	246 11.8	15.3	40 00.2	31	23 57.8	+52
15	113 34.4	12 58.5	·· 43.7	194 33.3	·· 52.8	21 49.0	·· 21.3	261 14.4	·· 15.2	54 22.3	31	·24 03.0	+51
16	128 36.9	27 57.7	43.5	209 36.0	53.0	36 50.9	21.3	276 17.0	15.2	68 44.4	30	24 08.1	+49
17	143 39.3	42 56.9	43.3	224 38.7	53.2	51 52.8	21.3	291 19.6	15.2	83 06.4	30	24 13.0	+48
18	158 41.8	57 56.0	+24 43.2	239 41.5	−25 53.4	66 54.6	+23 21.3	306 22.2	−10 15.1	97 28.4	29	+24 17.8	+45
19	173 44.3	72 55.2	43.0	254 44.2	53.6	81 56.5	21.3	321 24.8	15.1	111 50.3	30	24 22.3	+44
20	188 46.7	87 54.4	42.9	269 47.0	53.8	96 58.4	21.3	336 27.4	15.0	126 12.3	29	24 26.7	+42
21	203 49.2	102 53.5	·· 42.7	284 49.7	·· 54.0	112 00.2	·· 21.3	351 30.0	·· 15.0	140 34.2	29	·24 30.9	+40
22	218 51.7	117 52.7	42.5	299 52.4	54.2	127 02.1	21.3	6 32.6	15.0	154 56.1	28	24 34.9	+38
23	233 54.1	132 51.9	42.4	314 55.2	54.3	142 04.0	21.3	21 35.2	14.9	169 17.9	29	24 38.7	+36
1 0	248 56.6	147 51.0	+24 42.2	329 57.9	−25 54.5	157 05.8	+23 21.3	36 37.8	−10 14.9	183 39.8	28	+24 42.3	+35
1	263 59.0	162 50.2	42.0	345 00.7	54.7	172 07.7	21.3	51 40.4	14.9	198 01.6	28	24 45.8	+32
2	279 01.5	177 49.4	41.9	0 03.4	54.9	187 09.6	21.3	66 42.9	14.8	212 23.4	28	24 49.0	+31
3	294 04.0	192 48.5	·· 41.7	15 06.2	·· 55.1	202 11.4	·· 21.3	81 45.5	·· 14.8	226 45.2	28	·24 52.1	+29
4	309 06.4	207 47.7	41.5	30 09.0	55.3	217 13.3	21.3	96 48.1	14.7	241 07.0	27	24 55.0	+27
5	324 08.9	222 46.9	41.3	45 11.7	55.5	232 15.2	21.3	111 50.7	14.7	255 28.7	28	24 57.7	+25
6	339 11.4	237 46.0	+24 41.2	60 14.5	−25 55.7	247 17.0	+23 21.3	126 53.3	−10 14.7	269 50.5	28	+25 00.2	+24
7	354 13.8	252 45.2	41.0	75 17.2	55.8	262 18.9	21.3	141 55.9	14.6	284 12.3	28	25 02.6	+21
8	9 16.3	267 44.4	40.8	90 20.0	56.0	277 20.8	21.3	156 58.5	14.6	298 34.1	28	25 04.7	+20
9	24 18.8	282 43.6	·· 40.6	105 22.8	·· 56.2	292 22.6	·· 21.3	172 01.1	·· 14.6	312 55.9	28	·25 06.7	+18
10	39 21.2	297 42.7	40.5	120 25.5	56.4	307 24.5	21.3	187 03.7	14.5	327 17.7	28	25 08.5	+16
11	54 23.7	312 41.9	40.3	135 28.3	56.6	322 26.4	21.3	202 06.3	14.5	341 39.5	28	25 10.1	+14
12	69 26.2	327 41.1	+24 40.1	150 31.1	−25 56.8	337 28.2	+23 21.3	217 08.9	−10 14.4	356 01.3	28	+25 11.5	+12
13	84 28.6	342 40.2	39.9	165 33.8	57.0	352 30.1	21.3	232 11.5	14.4	10 23.1	28	25 12.7	+10
14	99 31.1	357 39.4	39.7	180 36.6	57.2	7 32.0	21.3	247 14.1	14.4	24 44.9	29	25 13.7	+9
15	114 33.5	12 38.6	·· 39.5	195 39.4	·· 57.4	22 33.8	·· 21.3	262 16.7	·· 14.3	39 06.8	29	·25 14.6	+6
16	129 36.0	27 37.8	39.4	210 42.1	57.5	37 35.7	21.3	277 19.3	14.3	53 28.7	29	25 15.2	+5
17	144 38.5	42 36.9	39.2	225 44.9	57.7	52 37.5	21.3	292 21.8	14.3	67 50.6	29	25 15.7	+3
18	159 40.9	57 36.1	+24 39.0	240 47.7	−25 57.9	67 39.4	+23 21.3	307 24.4	−10 14.2	82 12.5	30	+25 16.0	+1
19	174 43.4	72 35.3	38.8	255 50.5	58.1	82 41.3	21.2	322 27.0	14.2	96 34.5	30	25 16.1	−1
20	189 45.9	87 34.4	38.6	270 53.2	58.3	97 43.1	21.2	337 29.6	14.2	110 56.5	31	25 16.0	−2
21	204 48.3	102 33.6	·· 38.4	285 56.0	·· 58.5	112 45.0	·· 21.2	352 32.2	·· 14.1	125 18.6	30	·25 15.8	−5
22	219 50.8	117 32.8	38.2	300 58.8	58.7	127 46.9	21.2	7 34.8	14.1	139 40.6	32	25 15.3	−6
23	234 53.3	132 32.0	38.0	316 01.6	58.9	142 48.7	21.2	22 37.4	14.0	154 02.8	31	25 14.7	−8
2 0	249 55.7	147 31.1	+24 37.8	331 04.4	−25 59.1	157 50.6	+23 21.2	37 40.0	−10 14.0	168 24.9	32	+25 13.9	−10
1	264 58.2	162 30.3	37.6	346 07.2	59.3	172 52.5	21.2	52 42.6	14.0	182 47.1	33	25 12.9	−12
2	280 00.7	177 29.5	37.4	1 09.9	59.4	187 54.3	21.2	67 45.2	13.9	197 09.4	33	25 11.7	−13
3	295 03.1	192 28.7	·· 37.2	16 12.7	·· 59.6	202 56.2	·· 21.2	82 47.8	·· 13.9	211 31.7	34	·25 10.4	−16
4	310 05.6	207 27.8	37.0	31 15.5	25 59.8	217 58.1	21.2	97 50.4	13.9	225 54.1	34	25 08.8	−17
5	325 08.0	222 27.0	36.8	46 18.3	26 00.0	232 59.9	21.2	112 52.9	13.8	240 16.5	35	25 07.1	−19
6	340 10.5	237 26.2	+24 36.6	61 21.1	−26 00.2	248 01.8	+23 21.2	127 55.5	−10 13.8	254 39.0	35	+25 05.2	−20
7	355 13.0	252 25.4	36.4	76 23.9	00.4	263 03.7	21.2	142 58.1	13.8	269 01.5	36	25 03.2	−23
8	10 15.4	267 24.5	36.2	91 26.7	00.6	278 05.5	21.2	158 00.7	13.7	283 24.1	37	25 00.9	−24
9	25 17.9	282 23.7	·· 36.0	106 29.5	·· 00.8	293 07.4	·· 21.2	173 03.3	·· 13.7	297 46.8	37	·24 58.5	−26
10	40 20.4	297 22.9	35.8	121 32.3	01.0	308 09.2	21.2	188 05.9	13.7	312 09.5	38	24 55.9	−27
11	55 22.8	312 22.1	35.6	136 35.1	01.2	323 11.1	21.2	203 08.5	13.6	326 32.3	39	24 53.2	−30
12	70 25.3	327 21.2	+24 35.4	151 37.9	−26 01.4	338 13.0	+23 21.2	218 11.1	−10 13.6	340 55.2	40	+24 50.2	−31
13	85 27.8	342 20.4	35.1	166 40.7	01.5	353 14.8	21.2	233 13.7	13.5	355 18.2	40	24 47.1	−33
14	100 30.2	357 19.6	34.9	181 43.5	01.7	8 16.7	21.2	248 16.3	13.5	9 41.2	41	24 43.8	−34
15	115 32.7	12 18.8	·· 34.7	196 46.3	·· 01.9	23 18.6	·· 21.2	263 18.8	·· 13.5	24 04.3	42	·24 40.4	−36
16	130 35.1	27 18.0	34.5	211 49.1	02.1	38 20.4	21.2	278 21.4	13.4	38 27.5	43	24 36.8	−38
17	145 37.6	42 17.1	34.3	226 51.9	02.3	53 22.3	21.2	293 24.0	13.4	52 50.8	43	24 33.0	−39
18	160 40.1	57 16.3	+24 34.1	241 54.7	−26 02.5	68 24.2	+23 21.2	308 26.6	−10 13.4	67 14.1	44	+24 29.1	−41
19	175 42.5	72 15.5	33.8	256 57.5	02.7	83 26.0	21.2	323 29.2	13.3	81 37.5	46	24 25.0	−43
20	190 45.0	87 14.7	33.6	272 00.4	02.9	98 27.9	21.1	338 31.8	13.3	96 01.1	46	24 20.7	−44
21	205 47.5	102 13.9	·· 33.4	287 03.2	·· 03.1	113 29.8	·· 21.1	353 34.4	·· 13.3	110 24.7	47	·24 16.3	−46
22	220 49.9	117 13.0	33.2	302 06.0	03.3	128 31.6	21.1	8 37.0	13.2	124 48.4	48	24 11.7	−47
23	235 52.4	132 12.2	33.0	317 08.8	03.5	143 33.5	21.1	23 39.6	13.2	139 12.2	49	24 07.0	−49
24	250 54.9	147 11.4	+24 32.7	332 11.6	−26 03.7	158 35.3	+23 21.1	38 42.2	−10 13.2	153 36.1	49	+24 02.1	−51
code	—	−9	−2	+27	−2	+19	0	+26	0				

Day	GMT h	SUN GHA ° ′	SUN Dec. ° ′
31	0	180 39.0	+21 48.4
	1	195 38.9	48.8
	2	210 38.8	49.2
	3	225 38.8	·· 49.5
	4	240 38.7	49.9
	5	255 38.6	50.3
	6	270 38.5	+21 50.6
	7	285 38.4	51.0
	8	300 38.3	51.4
	9	315 38.2	·· 51.7
	10	330 38.1	52.1
	11	345 38.0	52.4
	12	0 37.9	+21 52.8
	13	15 37.9	53.2
	14	30 37.8	53.5
	15	45 37.7	·· 53.9
	16	60 37.6	54.2
	17	75 37.5	54.6
	18	90 37.4	+21 54.9
	19	105 37.3	55.3
	20	120 37.2	55.7
	21	135 37.1	·· 56.0
	22	150 37.0	56.4
	23	165 36.9	56.7
1	0	180 36.9	+21 57.1
	1	195 36.8	57.4
	2	210 36.7	57.8
	3	225 36.6	·· 58.1
	4	240 36.5	58.5
	5	255 36.4	58.8
	6	270 36.3	+21 59.2
	7	285 36.2	59.5
	8	300 36.1	21 59.9
	9	315 36.0	·22 00.2
	10	330 35.9	00.6
	11	345 35.8	00.9
	12	0 35.7	+22 01.2
	13	15 35.6	01.6
	14	30 35.5	01.9
	15	45 35.5	·· 02.3
	16	60 35.4	02.6
	17	75 35.3	03.0
	18	90 35.2	+22 03.3
	19	105 35.1	03.6
	20	120 35.0	04.0
	21	135 34.9	·· 04.3
	22	150 34.8	04.7
	23	165 34.7	05.0
2	0	180 34.6	+22 05.3
	1	195 34.5	05.7
	2	210 34.4	06.0
	3	225 34.3	·· 06.3
	4	240 34.2	06.7
	5	255 34.1	07.0
	6	270 34.0	+22 07.3
	7	285 33.9	07.7
	8	300 33.8	08.0
	9	315 33.7	·· 08.3
	10	330 33.6	08.7
	11	345 33.5	09.0
	12	0 33.4	+22 09.3
	13	15 33.3	09.6
	14	30 33.2	10.0
	15	45 33.1	·· 10.3
	16	60 33.0	· 10.6
	17	75 32.9	10.9
	18	90 32.8	+22 11.3
	19	105 32.7	11.6
	20	120 32.6	11.9
	21	135 32.5	·· 12.2
	22	150 32.4	12.6
	23	165 32.3	12.9
	24	180 32.2	+22 13.2
code		—	+ 4

STARS

No.	Name	SHA ° ′	Dec. ° ′
7	Acamar	315 52.2	−40 29.0
5	Achernar	335 59.9	−57 27.8
30	Acrux	173 58.7	−62 51.2
19	Adhara	255 47.6	−28 54.6
10	Aldebaran	291 40.6	+16 25.2
32	Alioth	166 59.0	+56 12.5
34	Alkaid	153 33.2	+49 32.5
55	Al Na'ir	28 39.0	−47 10.7
15	Alnilam	276 31.6	− 1 13.8
25	Alphard	218 39.7	− 8 27.8
41	Alphecca	126 48.1	+26 51.9
1	Alpheratz	358 29.5	+28 50.2
51	Altair	62 51.2	+ 8 44.7
2	Ankaa	353 59.4	−42 32.9
42	Antares	113 20.2	−26 20.1
37	Arcturus	146 35.8	+19 25.1
43	Atria	109 01.3	−68 56.9
22	Avior	234 36.6	−59 22.0
13	Bellatrix	279 19.8	+ 6 18.6
16	Betelg'se	271 49.5	+ 7 24.0
17	Canopus	264 16.3	−52 40.3
12	Capella	281 40.4	+45 57.3
53	Deneb	50 01.5	+45 06.8
28	Denebola	183 18.6	+14 49.6
4	Diphda	349 40.4	−18 14.0
27	Dubhe	194 45.6	+62 00.0
14	Elnath	279 09.0	+28 34.3
47	Eltanin	91 06.2	+51 29.5
54	Enif	34 30.5	+ 9 39.9
56	Fomalhaut	16 12.7	−29 51.6
31	Gacrux	172 50.2	−56 51.9
29	Gienah	176 37.8	−17 17.6
35	Hadar	149 50.4	−60 09.6
6	Hamal	328 51.1	+23 14.9
48	Kaus Aust.	84 42.1	−34 24.5
40	Kochab	137 16.6	+74 20.6
57	Markab	14 22.5	+14 57.5
8	Menkar	315 01.7	+ 3 54.8
36	Menkent	148 59.6	−36 09.1
24	Miapl'dus	221 49.8	−69 32.1
9	Mirfak	309 44.3	+49 42.0
50	Nunki	76 52.8	−26 21.3
52	Peacock	54 28.4	−56 52.8
21	Pollux	244 22.1	+28 08.3
20	Procyon	245 46.3	+ 5 20.6
46	R'alhague	96 47.2	+12 35.4
26	Regulus	208 30.6	+12 11.4
11	Rigel	281 54.9	− 8 15.2
38	Rigil Kent.	140 51.9	−60 39.3
44	Sabik	103 03.0	−15 40.3
3	Schedar	350 31.5	+56 17.1
45	Shaula	97 21.6	−37 04.4
18	Sirius	259 13.0	−16 39.2
33	Spica	159 17.7	−10 55.6
23	Suhail	223 25.3	−43 15.1
49	Vega	81 08.6	+38 44.3
39	Zub'g'bi	137 54.2	−15 51.4

Lat. °	Sunrise h m	Twlt. begins h m	Moonrise 31 h m	Moonrise 1 h m	Moonrise 2 h m	Moonrise 3 h m
N 72	□	□	□	□	□	□
70	□	□	□	□	□	□
68	□	□	□	□	□	□
66	1 14	////	0 17	□	□	2 32
64	1 59	////	0 57	1 09	1 58	3 41
62	2 28	////	1 25	1 52	2 48	4 17
60	2 50	////	1 46	2 21	3 19	4 42
58	3 08	////	2 04	2 43	3 43	5 02
56	3 22	////	2 19	3 01	4 02	5 19
54	3 35	////	2 32	3 17	4 18	5 33
52	3 46	////	2 43	3 30	4 32	5 45
50	3 56	0 09	2 53	3 42	4 44	5 56
45	4 17	1 54	3 15	4 06	5 09	6 19
40	4 33	2 35	3 32	4 26	5 29	6 37
35	4 47	3 04	3 47	4 42	5 45	6 52
30	4 59	3 26	3 59	4 57	5 59	7 05
20	5 20	3 57	4 21	5 21	6 24	7 28
10	5 38	4 21	4 40	5 42	6 45	7 47
0	5 54	4 40	4 58	6 02	7 05	8 05
10	6 10	4 55	5 16	6 21	7 25	8 24
20	6 28	5 09	5 35	6 42	7 46	8 43
30	6 48	5 22	5 58	7 07	8 10	9 05
35	6 59	5 28	6 11	7 22	8 25	9 18
40	7 12	5 35	6 26	7 38	8 41	9 33
45	7 28	5 42	6 45	7 58	9 01	9 51
50	7 47	5 49	7 07	8 24	9 26	10 13
52	7 56	5 51	7 18	8 36	9 38	10 23
54	8 06	5 54	7 31	8 50	9 52	10 35
56	8 17	5 58	7 45	9 07	10 08	10 49
58	8 30	6 01	8 02	9 26	10 26	11 04
60 S	8 46	6 04	8 22	9 51	10 50	11 23

Lat. °	Sunset h m	Twlt. ends h m	Moonset 31 h m	Moonset 1 h m	Moonset 2 h m	Moonset 3 h m
N 72	□	□	□	□	□	□
70	□	□	□	□	□	□
68	□	□	□	□	□	□
66	22 45	////	□	□	□	1 16
64	21 59	////	22 15	23 41	24 06	0 06
62	21 29	////	21 33	22 50	23 30	23 49
60	21 07	////	21 04	22 19	23 04	23 30
58	20 49	////	20 42	21 55	22 44	23 14
56	20 34	////	20 24	21 36	22 27	23 01
54	20 21	////	20 09	21 20	22 12	22 49
52	20 10	////	19 56	21 06	22 00	22 39
50	20 00	////	19 44	20 54	21 49	22 29
45	19 39	22 03	19 20	20 29	21 25	22 10
40	19 22	21 21	19 01	20 09	21 07	21 54
35	19 08	20 52	18 45	19 52	20 51	21 40
30	18 56	20 31	18 31	19 38	20 37	21 28
20	18 36	19 59	18 07	19 13	20 14	21 08
10	18 18	19 35	17 47	18 52	19 53	20 50
0	18 01	19 15	17 28	18 32	19 34	20 33
10	17 45	19 00	17 09	18 12	19 15	20 16
20	17 28	18 46	16 49	17 50	18 55	19 58
30	17 08	18 33	16 25	17 26	18 31	19 37
35	16 57	18 27	16 11	17 11	18 16	19 25
40	16 43	18 19	15 55	16 54	18 00	19 10
45	16 28	18 13	15 37	16 34	17 41	18 53
50	16 09	18 06	15 13	16 08	17 16	18 32
52	16 00	18 03	15 02	15 56	17 04	18 22
54	15 50	18 00	14 49	15 42	16 51	18 11
56	15 38	17 57	14 34	15 25	16 35	17 58
58	15 25	17 53	14 17	15 06	16 17	17 43
60 S	15 10	17 50	13 56	14 41	15 54	17 24

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0			
30	0.1	0.1	0.3
45	0.1	0.1	0.2
60	0.1	0.1	0.2
75	0.1	0.0	0.1
90	0.1	0.0	0.0

Moon's Lower Limb
Add

Alt. °	31 ′	1 ′	2 ′
0			
	20.1	19.7	18.9
4			
	20.1	19.7	18.8
8			
	20.1	19.7	18.8
12			
	20.0	19.7	18.8
16			
	20.0	19.6	18.7
20			
	19.9	19.5	18.7
24			
	19.8	19.4	18.6
28			
	19.7	19.3	18.5
32			
	19.5	19.2	18.4
36			
	19.4	19.1	18.3
40			
	19.2	18.9	18.2
44			
	19.0	18.7	18.1
48			
	18.8	18.6	17.9
52			
	18.6	18.4	17.8
56			
	18.4	18.2	17.6
60			
	18.2	18.0	17.5
64			
	18.0	17.8	17.3
68			
	17.8	17.6	17.1
72			
	17.5	17.4	17.0
76			
	17.3	17.1	16.8
80			
	17.0	16.9	16.6
84			
	16.8	16.7	16.4
88			
	16.6	16.5	16.3
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt. °	31 ′	1 ′	2 ′
0			
	12.9	13.2	13.7
4			
	13.0	13.2	13.7
8			
	13.0	13.2	13.7
12			
	13.0	13.2	13.7
16			
	13.1	13.3	13.8
20			
	13.2	13.4	13.8
24			
	13.3	13.5	13.9
28			
	13.4	13.6	14.0
32			
	13.5	13.7	14.1
36			
	13.7	13.8	14.2
40			
	13.9	14.0	14.3
44			
	14.0	14.2	14.5
48			
	14.2	14.3	14.6
52			
	14.4	14.5	14.7
56			
	14.6	14.7	14.9
60			
	14.8	14.9	15.0
64			
	15.1	15.1	15.2
68			
	15.3	15.3	15.4
72			
	15.5	15.5	15.5
76			
	15.8	15.8	15.7
80			
	16.0	16.0	15.9
84			
	16.3	16.2	16.1
88			
	16.5	16.4	16.2
90			

Subtract from table, back cover

Equation of Time (App.—Mean)

GMT h	31 m s	1 m s	2 m s
0	+ 2 36.2	+ 2 27.6	+ 2 18.6
6	+ 2 34.1	+ 2 25.4	+ 2 16.2
12	+ 2 32.0	+ 2 23.1	+ 2 13.9
18	+ 2 29.8	+ 2 20.9	+ 2 11.5
24	+ 2 27.6	+ 2 18.6	+ 2 09.1

GMT of Transit
Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
31	11 13	14 08	2 04	13 33	21 34
1	12 17	14 09	2 00	13 30	21 30
2	13 20	14 11	1 55	13 27	21 26
3	14 19	14 12	1 51	13 24	21 22

New Moon 1

	GMT	♈ GHA	VENUS −3.4 GHA	VENUS Dec.	MARS −1.8 GHA	MARS Dec.	JUPITER −1.4 GHA	JUPITER Dec.	SATURN 0.6 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
3	0	250 54.9	147 11.4	+24 32.7	332 11.6	−26 03.7	158 35.3	+23 21.1	38 42.2	−10 13.2	153 36.1	49	+24 02.1	−51
	1	265 57.3	162 10.6	32.5	347 14.4	03.9	173 37.2	21.1	53 44.7	13.1	168 00.0	51	23 57.0	−52
	2	280 59.8	177 09.8	32.3	2 17.3	04.0	188 39.1	21.1	68 47.3	13.1	182 24.1	52	23 51.8	−53
	3	296 02.3	192 08.9	32.0	17 20.1	04.2	203 40.9	21.1	83 49.9	13.1	196 48.3	53	23 46.5	−56
	4	311 04.7	207 08.1	31.8	32 22.9	04.4	218 42.8	21.1	98 52.5	13.0	211 12.6	54	23 40.9	−56
	5	326 07.2	222 07.3	31.6	47 25.7	04.6	233 44.7	21.1	113 55.1	13.0	225 37.0	54	23 35.3	−58
	6	341 09.6	237 06.5	+24 31.3	62 28.6	−26 04.8	248 46.5	+23 21.1	128 57.7	−10 12.9	240 01.4	56	+23 29.5	−60
	7	356 12.1	252 05.7	31.1	77 31.4	05.0	263 48.4	21.1	144 00.3	12.9	254 26.0	57	23 23.5	−61
	8	11 14.6	267 04.9	30.9	92 34.2	05.2	278 50.2	21.1	159 02.9	12.9	268 50.7	58	23 17.4	−62
	9	26 17.0	282 04.0	30.6	107 37.1	05.4	293 52.1	21.1	174 05.4	12.8	283 15.5	59	23 11.2	−64
	10	41 19.5	297 03.2	30.4	122 39.9	05.6	308 54.0	21.1	189 08.0	12.8	297 40.4	60	23 04.8	−65
	11	56 22.0	312 02.4	30.2	137 42.7	05.8	323 55.8	21.1	204 10.6	12.8	312 05.4	61	22 58.3	−67
	12	71 24.4	327 01.6	+24 29.9	152 45.6	−26 06.0	338 57.7	+23 21.1	219 13.2	−10 12.7	326 30.5	63	+22 51.6	−67
	13	86 26.9	342 00.8	29.7	167 48.4	06.2	353 59.6	21.1	234 15.8	12.7	340 55.8	63	22 44.9	−70
	14	101 29.4	357 00.0	29.4	182 51.2	06.4	9 01.4	21.1	249 18.4	12.7	355 21.1	64	22 37.9	−70
	15	116 31.8	11 59.1	29.2	197 54.1	06.6	24 03.3	21.1	264 21.0	12.6	9 46.5	66	22 30.9	−72
	16	131 34.3	26 58.3	29.0	212 56.9	06.8	39 05.1	21.0	279 23.5	12.6	24 12.1	67	22 23.7	−74
	17	146 36.8	41 57.5	28.7	227 59.8	06.9	54 07.0	21.0	294 26.1	12.6	38 37.8	67	22 16.3	−74
	18	161 39.2	56 56.7	+24 28.5	243 02.6	−26 07.1	69 08.9	+23 21.0	309 28.7	−10 12.5	53 03.5	69	+22 08.9	−76
	19	176 41.7	71 55.9	28.2	258 05.5	07.3	84 10.7	21.0	324 31.3	12.5	67 29.4	70	22 01.3	−77
	20	191 44.1	86 55.1	28.0	273 08.3	07.5	99 12.6	21.0	339 33.9	12.5	81 55.4	72	21 53.6	−78
	21	206 46.6	101 54.3	27.7	288 11.2	07.7	114 14.5	21.0	354 36.5	12.4	96 21.6	72	21 45.8	−80
	22	221 49.1	116 53.5	27.5	303 14.0	07.9	129 16.3	21.0	9 39.1	12.4	110 47.8	74	21 37.8	−80
	23	236 51.5	131 52.6	27.2	318 16.9	08.1	144 18.2	21.0	24 41.7	12.4	125 14.2	74	21 29.8	−82
4	0	251 54.0	146 51.8	+24 26.9	333 19.7	−26 08.3	159 20.0	+23 21.0	39 44.2	−10 12.3	139 40.6	76	+21 21.6	−83
	1	266 56.5	161 51.0	26.7	348 22.6	08.5	174 21.9	21.0	54 46.8	12.3	154 07.2	77	21 13.3	−84
	2	281 58.9	176 50.2	26.4	3 25.4	08.7	189 23.8	21.0	69 49.4	12.3	168 33.9	78	21 04.9	−86
	3	297 01.4	191 49.4	26.2	18 28.3	08.9	204 25.6	21.0	84 52.0	12.2	183 00.7	79	20 56.3	−86
	4	312 03.9	206 48.6	25.9	33 31.1	09.1	219 27.5	21.0	99 54.6	12.2	197 27.6	81	20 47.7	−88
	5	327 06.3	221 47.8	25.7	48 34.0	09.3	234 29.4	21.0	114 57.2	12.2	211 54.7	82	20 38.9	−88
	6	342 08.8	236 47.0	+24 25.4	63 36.9	−26 09.5	249 31.2	+23 21.0	129 59.7	−10 12.1	226 21.9	82	+20 30.1	−90
	7	357 11.3	251 46.2	25.1	78 39.7	09.7	264 33.1	21.0	145 02.3	12.1	240 49.1	84	20 21.1	−91
	8	12 13.7	266 45.3	24.9	93 42.6	09.9	279 34.9	21.0	160 04.9	12.1	255 16.5	86	20 12.0	−91
	9	27 16.2	281 44.5	24.6	108 45.5	10.1	294 36.8	21.0	175 07.5	12.0	269 44.1	86	20 02.9	−93
	10	42 18.6	296 43.7	24.3	123 48.3	10.3	309 38.7	20.9	190 10.1	12.0	284 11.7	87	19 53.6	−94
	11	57 21.1	311 42.9	24.1	138 51.2	10.4	324 40.5	20.9	205 12.7	12.0	298 39.4	89	19 44.2	−95
	12	72 23.6	326 42.1	+24 23.8	153 54.1	−26 10.6	339 42.4	+23 20.9	220 15.3	−10 11.9	313 07.3	90	+19 34.7	−95
	13	87 26.0	341 41.3	23.5	168 56.9	10.8	354 44.3	20.9	235 17.8	11.9	327 35.3	91	19 25.2	−97
	14	102 28.5	356 40.5	23.3	183 59.8	11.0	9 46.1	20.9	250 20.4	11.9	342 03.4	92	19 15.5	−98
	15	117 31.0	11 39.7	23.0	199 02.7	11.2	24 48.0	20.9	265 23.0	11.8	356 31.6	93	19 05.7	−98
	16	132 33.4	26 38.9	22.7	214 05.6	11.4	39 49.8	20.9	280 25.6	11.8	10 59.9	94	18 55.9	−100
	17	147 35.9	41 38.1	22.4	229 08.4	11.6	54 51.7	20.9	295 28.2	11.8	25 28.3	96	18 45.9	−100
	18	162 38.4	56 37.3	+24 22.2	244 11.3	−26 11.8	69 53.6	+23 20.9	310 30.8	−10 11.7	39 56.9	96	+18 35.9	−101
	19	177 40.8	71 36.5	21.9	259 14.2	12.0	84 55.4	20.9	325 33.3	11.7	54 25.5	98	18 25.8	−102
	20	192 43.3	86 35.7	21.6	274 17.1	12.2	99 57.3	20.9	340 35.9	11.7	68 54.3	99	18 15.6	−103
	21	207 45.8	101 34.9	21.3	289 19.9	12.4	114 59.1	20.9	355 38.5	11.6	83 23.2	100	18 05.3	−104
	22	222 48.2	116 34.1	21.0	304 22.8	12.6	130 01.0	20.9	10 41.1	11.6	97 52.2	101	17 54.9	−104
	23	237 50.7	131 33.3	20.8	319 25.7	12.8	145 02.9	20.9	25 43.7	11.6	112 21.3	102	17 44.5	−105
5	0	252 53.1	146 32.4	+24 20.5	334 28.6	−26 13.0	160 04.7	+23 20.9	40 46.3	−10 11.5	126 50.5	104	+17 34.0	−107
	1	267 55.6	161 31.6	20.2	349 31.5	13.2	175 06.6	20.9	55 48.8	11.5	141 19.9	104	17 23.3	−106
	2	282 58.1	176 30.8	19.9	4 34.4	13.4	190 08.4	20.8	70 51.4	11.5	155 49.3	106	17 12.7	−108
	3	298 00.5	191 30.0	19.6	19 37.3	13.6	205 10.3	20.8	85 54.0	11.4	170 18.9	106	17 01.9	−108
	4	313 03.0	206 29.2	19.3	34 40.2	13.8	220 12.2	20.8	100 56.6	11.4	184 48.5	108	16 51.1	−109
	5	328 05.5	221 28.4	19.0	49 43.1	14.0	235 14.0	20.8	115 59.2	11.4	199 18.3	109	16 40.2	−110
	6	343 07.9	236 27.6	+24 18.7	64 46.0	−26 14.2	250 15.9	+23 20.8	131 01.7	−10 11.3	213 48.2	110	+16 29.2	−110
	7	358 10.4	251 26.8	18.5	79 48.8	14.4	265 17.7	20.8	146 04.3	11.3	228 18.2	111	16 18.2	−112
	8	13 12.9	266 26.0	18.2	94 51.7	14.6	280 19.6	20.8	161 06.9	11.3	242 48.3	111	16 07.0	−111
	9	28 15.3	281 25.2	17.9	109 54.6	14.8	295 21.5	20.8	176 09.5	11.2	257 18.4	113	15 55.9	−113
	10	43 17.8	296 24.4	17.6	124 57.5	15.0	310 23.3	20.8	191 12.1	11.2	271 48.7	114	15 44.6	−113
	11	58 20.2	311 23.6	17.3	140 00.4	15.1	325 25.2	20.8	206 14.7	11.2	286 19.1	115	15 33.3	−113
	12	73 22.7	326 22.8	+24 17.0	155 03.4	−26 15.3	340 27.0	+23 20.8	221 17.2	−10 11.1	300 49.6	116	+15 22.0	−115
	13	88 25.2	341 22.0	16.7	170 06.3	15.5	355 28.9	20.8	236 19.8	11.1	315 20.2	118	15 10.5	−115
	14	103 27.6	356 21.2	16.4	185 09.2	15.7	10 30.8	20.8	251 22.4	11.1	329 51.0	118	14 59.0	−115
	15	118 30.1	11 20.4	16.1	200 12.1	15.9	25 32.6	20.8	266 25.0	11.0	344 21.8	119	14 47.5	−116
	16	133 32.6	26 19.6	15.8	215 15.0	16.1	40 34.5	20.7	281 27.6	11.0	358 52.7	120	14 35.9	−117
	17	148 35.0	41 18.8	15.5	230 17.9	16.3	55 36.3	20.7	296 30.1	11.0	13 23.7	121	14 24.2	−117
	18	163 37.5	56 18.0	+24 15.2	245 20.8	−26 16.5	70 38.2	+23 20.7	311 32.7	−10 11.0	27 54.8	121	+14 12.5	−117
	19	178 40.0	71 17.2	14.9	260 23.7	16.7	85 40.1	20.7	326 35.3	10.9	42 25.9	123	14 00.8	−118
	20	193 42.4	86 16.4	14.5	275 26.6	16.9	100 41.9	20.7	341 37.9	10.9	56 57.2	124	13 49.0	−119
	21	208 44.9	101 15.7	14.2	290 29.5	17.1	115 43.8	20.7	356 40.5	10.9	71 28.6	125	13 37.1	−119
	22	223 47.4	116 14.9	13.9	305 32.5	17.3	130 45.6	20.7	11 43.0	10.8	86 00.1	126	13 25.2	−120
	23	238 49.8	131 14.1	13.6	320 35.4	17.5	145 47.5	20.7	26 45.6	10.8	100 31.7	126	13 13.2	−120
	24	253 52.3	146 13.3	+24 13.3	335 38.3	−26 17.7	160 49.4	+23 20.7	41 48.2	−10 10.8	115 03.3	128	+13 01.2	−120
	code	—	−8	−3	+28	−2	+19	0	+25	0				

GMT		SUN GHA	SUN Dec.
d	h	° ′	° ′
3	0	180 32.2	+22 13.2
	1	195 32.1	13.5
	2	210 32.0	13.8
	3	225 31.9 ··	14.2
	4	240 31.8	14.5
	5	255 31.7	14.8
	6	270 31.6	+22 15.1
	7	285 31.5	15.4
	8	300 31.4	15.7
	9	315 31.3 ··	16.1
	10	330 31.2	16.4
	11	345 31.1	16.7
	12	0 31.0	+22 17.0
	13	15 30.9	17.3
	14	30 30.8	17.6
	15	45 30.7 ··	17.9
	16	60 30.6	18.2
	17	75 30.5	18.5
	18	90 30.4	+22 18.9
	19	105 30.3	19.2
	20	120 30.2	19.5
	21	135 30.1 ··	19.8
	22	150 30.0	20.1
	23	165 29.9	20.4
4	0	180 29.8	+22 20.7
	1	195 29.7	21.0
	2	210 29.6	21.3
	3	225 29.5 ··	21.6
	4	240 29.4	21.9
	5	255 29.2	22.2
	6	270 29.1	+22 22.5
	7	285 29.0	22.8
	8	300 28.9	23.1
	9	315 28.8 ··	23.4
	10	330 28.7	23.7
	11	345 28.6	24.0
	12	0 28.5	+22 24.3
	13	15 28.4	24.6
	14	30 28.3	24.9
	15	45 28.2 ··	25.2
	16	60 28.1	25.5
	17	75 28.0	25.8
	18	90 27.9	+22 26.0
	19	105 27.8	26.3
	20	120 27.7	26.6
	21	135 27.6 ··	26.9
	22	150 27.4	27.2
	23	165 27.3	27.5
5	0	180 27.2	+22 27.8
	1	195 27.1	28.1
	2	210 27.0	28.4
	3	225 26.9 ··	28.6
	4	240 26.8	28.9
	5	255 26.7	29.2
	6	270 26.6	+22 29.5
	7	285 26.5	29.8
	8	300 26.4	30.1
	9	315 26.3 ··	30.3
	10	330 26.1	30.6
	11	345 26.0	30.9
	12	0 25.9	+22 31.2
	13	15 25.8	31.5
	14	30 25.7	31.7
	15	45 25.6 ··	32.0
	16	60 25.5	32.3
	17	75 25.4	32.6
	18	90 25.3	+22 32.8
	19	105 25.2	33.1
	20	120 25.0	33.4
	21	135 24.9 ··	33.7
	22	150 24.8	33.9
	23	165 24.7	34.2
	24	180 24.6	+22 34.5
code		—	+ 3

STARS

No.	Name	SHA ° ′	Dec. ° ′
7	Acamar	315 52.2	−40 29.0
5	Achernar	335 59.9	−57 27.8
30	Acrux	173 58.8	−62 51.2
19	Adhara	255 47.7	−28 54.6
10	Aldebaran	291 40.6	+16 25.2
32	Alioth	166 59.0	+56 12.5
34	Alkaid	153 33.2	+49 32.5
55	Al Na'ir	28 39.0	−47 10.7
15	Alnilam	276 31.6	− 1 13.8
25	Alphard	218 39.7	− 8 27.7
41	Alphecca	126 48.1	+26 52.0
1	Alpheratz	358 29.5	+28 50.2
51	Altair	62 51.1	+ 8 44.7
2	Ankaa	353 59.4	−42 32.9
42	Antares	113 20.2	−26 20.1
37	Arcturus	146 35.8	+19 25.1
43	Atria	109 01.3	−68 56.9
22	Avior	234 36.7	−59 22.0
13	Bellatrix	279 19.8	+ 6 18.6
16	Betelg'se	271 49.5	+ 7 24.0
17	Canopus	264 16.3	−52 40.3
12	Capella	281 40.4	+45 57.3
53	Deneb	50 01.4	+45 06.8
28	Denebola	183 18.6	+14 49.6
4	Diphda	349 40.4	−18 14.0
27	Dubhe	194 45.7	+62 00.0
14	Elnath	279 09.0	+28 34.3
47	Eltanin	91 06.2	+51 29.5
54	Enif	34 30.5	+ 9 39.9
56	Fomalhaut	16 12.7	−29 51.6
31	Gacrux	172 50.2	−56 51.9
29	Gienah	176 37.8	−17 17.6
35	Hadar	149 50.4	−60 09.6
6	Hamal	328 51.0	+23 14.9
48	Kaus Aust.	84 42.1	−34 24.5
40	Kochab	137 16.6	+74 20.6
57	Markab	14 22.5	+14 57.6
8	Menkar	315 01.6	+ 3 54.8
36	Menkent	148 59.6	−36 09.1
24	Miapl'dus	221 49.8	−69 32.1
9	Mirfak	309 44.3	+49 42.0
50	Nunki	76 52.8	−26 21.3
52	Peacock	54 28.4	−56 52.8
21	Pollux	244 22.1	+28 08.3
20	Procyon	245 46.3	+ 5 20.6
46	R'alhague	96 47.2	+12 35.4
26	Regulus	208 30.6	+12 11.4
11	Rigel	281 54.9	− 8 15.2
38	Rigil Kent.	140 51.9	−60 39.3
44	Sabik	103 03.0	−15 40.3
3	Schedar	350 31.5	+56 17.1
45	Shaula	97 21.6	−37 04.4
18	Sirius	259 13.0	−16 39.2
33	Spica	159 17.7	−10 55.6
23	Suhail	223 25.3	−43 15.1
49	Vega	81 08.5	+38 44.3
39	Zub'g'bi	137 54.2	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 3	Moonrise 4	Moonrise 5	Moonrise 6
N °	h m	h m	h m	h m	h m	h m
72	▭	▭	▭	▭	5 21	8 04
70	▭	▭	▭	▭	6 11	8 24
68	▭	▭	▭	4 17	6 42	8 39
66	1 01	////	2 32	5 04	7 05	8 52
64	1 52	////	3 41	5 35	7 22	9 02
62	2 23	////	4 17	5 57	7 37	9 11
60	2 46	////	4 42	6 16	7 49	9 18
58	3 04	////	5 02	6 31	8 00	9 25
56	3 19	////	5 19	6 44	8 09	9 31
54	3 33	////	5 33	6 55	8 17	9 36
52	3 44	////	5 45	7 05	8 24	9 41
50	3 54	////	5 56	7 14	8 31	9 45
45	4 15	1 50	6 19	7 32	8 45	9 54
40	4 32	2 33	6 37	7 47	8 56	10 02
35	4 46	3 02	6 52	8 00	9 06	10 08
30	4 59	3 24	7 05	8 11	9 14	10 14
20	5 20	3 57	7 28	8 30	9 29	10 24
10	5 38	4 21	7 47	8 46	9 41	10 32
0	5 54	4 40	8 05	9 02	9 53	10 40
10	6 11	4 56	8 24	9 17	10 05	10 48
20	6 29	5 10	8 43	9 33	10 17	10 57
30	6 49	5 23	9 05	9 52	10 32	11 06
35	7 01	5 30	9 18	10 03	10 40	11 12
40	7 14	5 36	9 33	10 15	10 49	11 18
45	7 30	5 44	9 51	10 30	11 00	11 25
50	7 49	5 50	10 13	10 47	11 13	11 34
52	7 59	5 54	10 23	10 56	11 20	11 38
54	8 09	5 57	10 35	11 05	11 26	11 42
56	8 21	6 00	10 49	11 15	11 34	11 47
58	8 34	6 04	11 04	11 27	11 42	11 53
60	8 50	6 08	11 23	11 41	11 52	11 59
S						

Lat.	Sunset	Twlt. ends	Moonset 3	Moonset 4	Moonset 5	Moonset 6
N °	h m	h m	h m	h m	h m	h m
72	▭	▭	▭	▭	2 19	1 17
70	▭	▭	▭	▭	1 28	0 55
68	▭	▭	▭	1 32	0 56	0 38
66	23 00	////	1 16	0 44	0 32	0 23
64	22 07	////	0 06	0 12	0 13	0 12
62	21 35	////	23 49	23 57	24 02	0 02
60	21 12	////	23 30	23 44	23 53	23 59
58	20 53	////	23 14	23 33	23 46	23 55
56	20 38	////	23 01	23 23	23 39	23 51
54	20 24	////	22 49	23 14	23 33	23 47
52	20 13	////	22 39	23 06	23 27	23 44
50	20 03	////	22 29	22 59	23 23	23 41
45	19 41	22 07	22 10	22 44	23 12	23 35
40	19 24	21 24	21 54	22 31	23 03	23 30
35	19 10	20 55	21 40	22 21	22 55	23 25
30	18 58	20 33	21 28	22 11	22 48	23 21
20	18 37	20 00	21 08	21 55	22 36	23 14
10	18 19	19 36	20 50	21 40	22 26	23 07
0	18 02	19 17	20 33	21 27	22 16	23 01
10	17 45	19 00	20 16	21 13	22 06	22 55
20	17 28	18 46	19 58	20 58	21 55	22 49
30	17 08	18 33	19 37	20 42	21 43	22 41
35	16 56	18 26	19 25	20 32	21 36	22 37
40	16 42	18 19	19 10	20 20	21 28	22 32
45	16 26	18 12	18 53	20 07	21 18	22 26
50	16 07	18 05	18 32	19 50	21 07	22 19
52	15 58	18 02	18 22	19 43	21 01	22 16
54	15 47	17 58	18 11	19 34	20 55	22 13
56	15 36	17 56	17 58	19 24	20 48	22 09
58	15 22	17 52	17 43	19 13	20 41	22 04
60	15 06	17 48	17 24	19 00	20 32	21 59
S						

Equation of Time (App — Mean)

GMT	3	4	5
h	m s	m s	m s
0	+ 2 09.1	+ 1 59.3	+ 1 49.1
6	+ 2 06.7	+ 1 56.8	+ 1 46.5
12	+ 2 04.2	+ 1 54.3	+ 1 43.9
18	+ 2 01.8	+ 1 51.7	+ 1 41.3
24	+ 1 59.3	+ 1 49.1	+ 1 38.6

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
3	14 19	14 12	1 51	13 24	21 22
4	15 14	14 13	1 46	13 21	21 17
5	16 05	14 15	1 42	13 18	21 13
6	16 51	14 16	1 37	13 15	21 09

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0			
30	0.1	0.1	0.3
45	0.1	0.1	0.2
60	0.1	0.1	0.2
75	0.1	0.0	0.1
90	0.1	0.0	0.0

Moon's Lower Limb Add

Alt. °	3 ′	4 ′	5 ′
0			
4	17.8	16.7	15.6
8	17.8	16.7	15.6
12	17.8	16.7	15.6
16	17.8	16.7	15.6
20	17.8	16.7	15.6
24	17.7	16.6	15.6
28	17.7	16.6	15.6
32	17.6	16.6	15.6
36	17.5	16.5	15.6
40	17.5	16.5	15.6
44	17.4	16.5	15.6
48	17.3	16.4	15.6
52	17.2	16.4	15.6
56	17.1	16.3	15.6
60	17.0	16.3	15.6
64	16.9	16.2	15.6
68	16.8	16.2	15.6
72	16.7	16.1	15.6
76	16.5	16.0	15.6
80	16.4	16.0	15.6
84	16.3	15.9	15.6
88	16.2	15.9	15.6
90	16.1	15.8	15.6

Add to table, back cover

Moon's Upper Limb Subtract

Alt. °	3 ′	4 ′	5 ′
0			
4	14.2	14.9	15.6
8	14.3	14.9	15.6
12	14.3	14.9	15.6
16	14.3	14.9	15.6
20	14.3	14.9	15.6
24	14.4	15.0	15.6
28	14.4	15.0	15.6
32	14.5	15.0	15.6
36	14.5	15.0	15.6
40	14.6	15.1	15.6
44	14.7	15.1	15.6
48	14.8	15.2	15.6
52	14.9	15.2	15.6
56	15.0	15.3	15.6
60	15.1	15.3	15.6
64	15.2	15.4	15.6
68	15.3	15.4	15.6
72	15.4	15.5	15.6
76	15.5	15.5	15.6
80	15.7	15.6	15.6
84	15.8	15.7	15.6
88	15.9	15.7	15.6
90	16.0	15.8	15.6

Subtract from table, back cover

GMT		♈ GHA	VENUS −3.4 GHA	VENUS −3.4 Dec.	MARS −1.8 GHA	MARS −1.8 Dec.	JUPITER −1.4 GHA	JUPITER −1.4 Dec.	SATURN 0.6 GHA	SATURN 0.6 Dec.	MOON GHA	code	MOON Dec.	code
	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
6	0	253 52.3	146 13.3	+24 13.3	335 38.3	−26 17.7	160 49.4	+23 20.7	41 48.2	−10 10.8	115 03.3	128	+13 01.2	−120
	1	268 54.7	161 12.5	13.0	350 41.2	17.9	175 51.2	20.7	56 50.8	10.7	129 35.1	128	12 49.2	−121
	2	283 57.2	176 11.7	12.7	5 44.1	18.1	190 53.1	20.7	71 53.4	10.7	144 06.9	129	12 37.1	−121
	3	298 59.7	191 10.9	·· 12.4	20 47.1	·· 18.3	205 54.9	·· 20.7	86 55.9	·· 10.7	158 38.8	130	·12 25.0	−122
	4	314 02.1	206 10.1	12.0	35 50.0	18.5	220 56.8	20.7	101 58.5	10.6	173 10.8	131	12 12.8	−122
	5	329 04.6	221 09.3	11.7	50 52.9	18.7	235 58.7	20.7	117 01.1	10.6	187 42.9	132	12 00.6	−123
	6	344 07.1	236 08.5	+24 11.4	65 55.8	−26 18.9	251 00.5	+23 20.6	132 03.7	−10 10.6	202 15.1	133	+11 48.3	−123
	7	359 09.5	251 07.7	11.1	80 58.8	19.1	266 02.4	20.6	147 06.2	10.5	216 47.4	133	11 36.0	−123
	8	14 12.0	266 06.9	10.8	96 01.7	19.3	281 04.2	20.6	162 08.8	10.5	231 19.7	134	11 23.7	−124
	9	29 14.5	281 06.1	·· 10.4	111 04.6	·· 19.5	296 06.1	·· 20.6	177 11.4	·· 10.5	245 52.1	135	·11 11.3	−124
	10	44 16.9	296 05.3	10.1	126 07.6	19.7	311 08.0	20.6	192 14.0	10.5	260 24.6	136	10 58.9	−124
	11	59 19.4	311 04.5	09.8	141 10.5	19.9	326 09.8	20.6	207 16.6	10.4	274 57.2	137	10 46.5	−125
	12	74 21.9	326 03.8	+24 09.5	156 13.4	−26 20.1	341 11.7	+23 20.6	222 19.1	−10 10.4	289 29.9	137	+10 34.0	−125
	13	89 24.3	341 03.0	09.1	171 16.4	20.3	356 13.5	20.6	237 21.7	10.4	304 02.6	138	10 21.5	−125
	14	104 26.8	356 02.2	08.8	186 19.3	20.5	11 15.4	20.6	252 24.3	10.3	318 35.4	139	10 09.0	−126
	15	119 29.2	11 01.4	·· 08.5	201 22.3	·· 20.7	26 17.3	·· 20.6	267 26.9	·· 10.3	333 08.3	140	· 9 56.4	−125
	16	134 31.7	26 00.6	08.1	216 25.2	20.9	41 19.1	20.6	282 29.5	10.3	347 41.3	140	9 43.9	−126
	17	149 34.2	40 59.8	07.8	231 28.1	21.1	56 21.0	20.6	297 32.0	10.2	2 14.3	141	9 31.3	−127
	18	164 36.6	55 59.0	+24 07.5	246 31.1	−26 21.3	71 22.8	+23 20.5	312 34.6	−10 10.2	16 47.4	142	+ 9 18.6	−126
	19	179 39.1	70 58.2	07.1	261 34.0	21.5	86 24.7	20.5	327 37.2	10.2	31 20.6	143	9 06.0	−127
	20	194 41.6	85 57.4	06.8	276 37.0	21.7	101 26.5	20.5	342 39.8	10.1	45 53.9	143	8 53.3	−127
	21	209 44.0	100 56.7	·· 06.5	291 39.9	·· 21.9	116 28.4	·· 20.5	357 42.3	·· 10.1	60 27.2	144	· 8 40.6	−128
	22	224 46.5	115 55.9	06.1	306 42.9	22.1	131 30.3	20.5	12 44.9	10.1	75 00.6	144	8 27.8	−127
	23	239 49.0	130 55.1	05.8	321 45.8	22.3	146 32.1	20.5	27 47.5	10.1	89 34.0	145	8 15.1	−128
7	0	254 51.4	145 54.3	+24 05.5	336 48.8	−26 22.5	161 34.0	+23 20.5	42 50.1	−10 10.0	104 07.5	146	+ 8 02.3	−128
	1	269 53.9	160 53.5	05.1	351 51.7	22.7	176 35.8	20.5	57 52.6	10.0	118 41.1	146	7 49.5	−128
	2	284 56.4	175 52.7	04.8	6 54.7	22.9	191 37.7	20.5	72 55.2	10.0	133 14.7	147	7 36.7	−128
	3	299 58.8	190 51.9	·· 04.4	21 57.6	·· 23.1	206 39.6	·· 20.5	87 57.8	·· 09.9	147 48.4	148	· 7 23.9	−129
	4	315 01.3	205 51.2	04.1	37 00.6	23.3	221 41.4	20.5	103 00.4	09.9	162 22.2	148	7 11.0	−128
	5	330 03.7	220 50.4	03.7	52 03.6	23.4	236 43.3	20.5	118 02.9	09.9	176 56.0	148	6 58.2	−129
	6	345 06.2	235 49.6	+24 03.4	67 06.5	−26 23.6	251 45.1	+23 20.4	133 05.5	−10 09.8	191 29.8	150	+ 6 45.3	−129
	7	0 08.7	250 48.8	03.0	82 09.5	23.8	266 47.0	20.4	148 08.1	09.8	206 03.8	150	6 32.4	−129
	8	15 11.1	265 48.0	02.7	97 12.4	24.0	281 48.8	20.4	163 10.7	09.8	220 37.8	150	6 19.5	−129
	9	30 13.6	280 47.2	·· 02.3	112 15.4	·· 24.2	296 50.7	·· 20.4	178 13.2	·· 09.8	235 11.8	151	· 6 06.6	−129
	10	45 16.1	295 46.5	02.0	127 18.4	24.4	311 52.6	20.4	193 15.8	09.7	249 45.9	151	5 53.7	−130
	11	60 18.5	310 45.7	01.6	142 21.3	24.6	326 54.4	20.4	208 18.4	09.7	264 20.0	152	5 40.7	−129
	12	75 21.0	325 44.9	+24 01.3	157 24.3	−26 24.8	341 56.3	+23 20.4	223 21.0	−10 09.7	278 54.2	153	+ 5 27.8	−130
	13	90 23.5	340 44.1	00.9	172 27.3	25.0	356 58.1	20.4	238 23.5	09.6	293 28.5	152	5 14.8	−129
	14	105 25.9	355 43.3	00.6	187 30.2	25.2	12 00.0	20.4	253 26.1	09.6	308 02.7	154	5 01.9	−130
	15	120 28.4	10 42.6	·24 00.2	202 33.2	·· 25.4	27 01.9	·· 20.4	268 28.7	·· 09.6	322 37.1	154	· 4 48.9	−130
	16	135 30.8	25 41.8	23 59.8	217 36.2	25.6	42 03.7	20.4	283 31.3	09.6	337 11.5	154	4 35.9	−130
	17	150 33.3	40 41.0	59.5	232 39.2	25.8	57 05.6	20.3	298 33.8	09.5	351 45.9	154	4 22.9	−130
	18	165 35.8	55 40.2	+23 59.1	247 42.1	−26 26.0	72 07.4	+23 20.3	313 36.4	−10 09.5	6 20.3	156	+ 4 09.9	−129
	19	180 38.2	70 39.5	58.8	262 45.1	26.2	87 09.3	20.3	328 39.0	09.5	20 54.9	155	3 57.0	−130
	20	195 40.7	85 38.7	58.4	277 48.1	26.4	102 11.1	20.3	343 41.6	09.4	35 29.4	156	3 44.0	−130
	21	210 43.2	100 37.9	·· 58.0	292 51.1	·· 26.6	117 13.0	·· 20.3	358 44.1	·· 09.4	50 04.0	156	· 3 31.0	−130
	22	225 45.6	115 37.1	57.7	307 54.1	26.8	132 14.9	20.3	13 46.7	09.4	64 38.6	157	3 18.0	−130
	23	240 48.1	130 36.3	57.3	322 57.0	27.0	147 16.7	20.3	28 49.3	09.3	79 13.3	157	3 05.0	−130
8	0	255 50.6	145 35.6	+23 56.9	338 00.0	−26 27.2	162 18.6	+23 20.3	43 51.9	−10 09.3	93 48.0	157	+ 2 52.0	−130
	1	270 53.0	160 34.8	56.6	353 03.0	27.4	177 20.4	20.3	58 54.4	09.3	108 22.7	158	2 39.0	−130
	2	285 55.5	175 34.0	56.2	8 06.0	27.6	192 22.3	20.3	73 57.0	09.3	122 57.5	158	2 26.0	−130
	3	300 58.0	190 33.2	·· 55.8	23 09.0	·· 27.8	207 24.1	·· 20.2	88 59.6	·· 09.2	137 32.3	159	· 2 13.0	−130
	4	316 00.4	205 32.5	55.4	38 12.0	28.0	222 26.0	20.2	104 02.1	09.2	152 07.2	158	2 00.0	−130
	5	331 02.9	220 31.7	55.1	53 15.0	28.2	237 27.9	20.2	119 04.7	09.2	166 42.0	159	1 47.0	−130
	6	346 05.3	235 30.9	+23 54.7	68 17.9	−26 28.4	252 29.7	+23 20.2	134 07.3	−10 09.1	181 16.9	160	+ 1 34.0	−130
	7	1 07.8	250 30.1	54.3	83 20.9	28.6	267 31.6	20.2	149 09.9	09.1	195 51.9	159	1 21.0	−130
	8	16 10.3	265 29.4	53.9	98 23.9	28.8	282 33.4	20.2	164 12.4	09.1	210 26.8	160	1 08.0	−129
	9	31 12.7	280 28.6	·· 53.6	113 26.9	·· 29.0	297 35.3	·· 20.2	179 15.0	·· 09.1	225 01.8	160	· 0 55.1	−130
	10	46 15.2	295 27.8	53.2	128 29.9	29.2	312 37.1	20.2	194 17.6	09.0	239 36.8	160	0 42.1	−129
	11	61 17.7	310 27.1	52.8	143 32.9	29.4	327 39.0	20.2	209 20.1	09.0	254 11.8	161	0 29.2	−130
	12	76 20.1	325 26.3	+23 52.4	158 35.9	−26 29.6	342 40.9	+23 20.2	224 22.7	−10 09.0	268 46.9	161	+ 0 16.2	−129
	13	91 22.6	340 25.5	52.0	173 38.9	29.8	357 42.7	20.2	239 25.3	08.9	283 22.0	161	+ 0 03.3	−130
	14	106 25.1	355 24.7	51.6	188 41.9	30.0	12 44.6	20.1	254 27.9	08.9	297 57.1	161	− 0 09.7	−129
	15	121 27.5	10 24.0	·· 51.3	203 44.9	·· 30.2	27 46.4	·· 20.1	269 30.4	·· 08.9	312 32.2	161	· 0 22.6	−129
	16	136 30.0	25 23.2	50.9	218 47.9	30.4	42 48.3	20.1	284 33.0	08.9	327 07.3	162	0 35.5	−129
	17	151 32.5	40 22.4	50.5	233 50.9	30.6	57 50.1	20.1	299 35.6	08.8	341 42.5	161	0 48.4	−129
	18	166 34.9	55 21.7	+23 50.1	248 53.9	−26 30.8	72 52.0	+23 20.1	314 38.1	−10 08.8	356 17.6	162	− 1 01.3	−128
	19	181 37.4	70 20.9	49.7	263 56.9	31.0	87 53.9	20.1	329 40.7	08.8	10 52.8	162	1 14.1	−129
	20	196 39.8	85 20.1	49.3	279 00.0	31.2	102 55.7	20.1	344 43.3	08.7	25 28.0	162	1 27.0	−128
	21	211 42.3	100 19.4	·· 48.9	294 03.0	·· 31.4	117 57.6	·· 20.1	359 45.9	·· 08.7	40 03.2	162	· 1 39.8	−129
	22	226 44.8	115 18.6	48.5	309 06.0	31.6	132 59.4	20.1	14 48.4	08.7	54 38.4	163	1 52.7	−128
	23	241 47.2	130 17.8	48.1	324 09.0	31.8	148 01.3	20.0	29 51.0	08.7	69 13.7	162	2 05.5	−128
	24	256 49.7	145 17.1	+23 47.7	339 12.0	−26 32.0	163 03.1	+23 20.0	44 53.6	−10 08.6	83 48.9	163	− 2 18.3	−128
code		—	− 8	− 4	+ 30	− 2	+ 18	0	+ 25	+ 1				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
6 0	180 24.6	+22 34.5
1	195 24.5	34.8
2	210 24.4	35.0
3	225 24.3	•• 35.3
4	240 24.2	35.6
5	255 24.0	35.8
6	270 23.9	+22 36.1
7	285 23.8	36.4
8	300 23.7	36.6
9	315 23.6	•• 36.9
10	330 23.5	37.2
11	345 23.4	37.4
12	0 23.3	+22 37.7
13	15 23.2	37.9
14	30 23.0	38.2
15	45 22.9	•• 38.5
16	60 22.8	38.7
17	75 22.7	39.0
18	90 22.6	+22 39.2
19	105 22.5	39.5
20	120 22.4	39.8
21	135 22.2	•• 40.0
22	150 22.1	40.3
23	165 22.0	40.5
7 0	180 21.9	+22 40.8
1	195 21.8	41.0
2	210 21.7	41.3
3	225 21.6	•• 41.5
4	240 21.4	41.8
5	255 21.3	42.1
6	270 21.2	+22 42.3
7	285 21.1	42.6
8	300 21.0	42.8
9	315 20.9	•• 43.0
10	330 20.8	43.3
11	345 20.6	43.5
12	0 20.5	+22 43.8
13	15 20.4	44.0
14	30 20.3	44.3
15	45 20.2	•• 44.5
16	60 20.1	44.8
17	75 19.9	45.0
18	90 19.8	+22 45.3
19	105 19.7	45.5
20	120 19.6	45.7
21	135 19.5	•• 46.0
22	150 19.4	46.2
23	165 19.2	46.5
8 0	180 19.1	+22 46.7
1	195 19.0	46.9
2	210 18.9	47.2
3	225 18.8	•• 47.4
4	240 18.7	47.6
5	255 18.5	47.9
6	270 18.4	+22 48.1
7	285 18.3	48.3
8	300 18.2	48.6
9	315 18.1	•• 48.8
10	330 18.0	49.0
11	345 17.8	49.3
12	0 17.7	+22 49.5
13	15 17.6	49.7
14	30 17.5	50.0
15	45 17.4	•• 50.2
16	60 17.2	50.4
17	75 17.1	50.6
18	90 17.0	+22 50.9
19	105 16.9	51.1
20	120 16.8	51.3
21	135 16.7	•• 51.5
22	150 16.5	51.8
23	165 16.4	52.0
24	180 16.3	+22 52.2
code	—	+ 2

STARS No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 52.2	−40 29.0
5	Achernar	335 59.9	−57 27.7
30	Acrux	173 58.8	−62 51.2
19	Adhara	255 47.7	−28 54.6
10	Aldebaran	291 40.5	+16 25.2
32	Alioth	166 59.0	+56 12.5
34	Alkaid	153 33.3	+49 32.5
55	Al Na'ir	28 39.0	−47 10.7
15	Alnilam	276 31.6	− 1 13.8
25	Alphard	218 39.7	− 8 27.7
41	Alphecca	126 48.1	+26 52.0
1	Alpheratz	358 29.5	+28 50.3
51	Altair	62 51.1	+ 8 44.8
2	Ankaa	353 59.3	−42 32.9
42	Antares	113 20.2	−26 20.1
37	Arcturus	146 35.8	+19 25.1
43	Atria	109 01.3	−68 56.9
22	Avior	234 36.7	−59 22.0
13	Bellatrix	279 19.8	+ 6 18.6
16	Betelg'se	271 49.5	+ 7 24.0
17	Canopus	264 16.3	−52 40.3
12	Capella	281 40.4	+45 57.3
53	Deneb	50 01.4	+45 06.8
28	Denebola	183 18.7	+14 49.6
4	Diphda	349 40.4	−18 14.0
27	Dubhe	194 45.7	+62 00.0
14	Elnath	279 09.0	+28 34.3
47	Eltanin	91 06.2	+51 29.5
54	Enif	34 30.4	+ 9 39.9
56	Fomalhaut	16 12.6	−29 51.6
31	Gacrux	172 50.2	−56 51.9
29	Gienah	176 37.8	−17 17.6
35	Hadar	149 50.4	−60 09.6
6	Hamal	328 51.0	+23 14.9
48	Kaus Aust.	84 42.1	−34 24.5
40	Kochab	137 16.7	+74 20.6
57	Markab	14 22.4	+14 57.6
8	Menkar	315 01.6	+ 3 54.8
36	Menkent	148 59.6	−36 09.1
24	Miapl'dus	221 49.8	−69 32.1
9	Mirfak	309 44.3	+49 42.0
50	Nunki	76 52.8	−26 21.3
52	Peacock	54 28.3	−56 52.8
21	Pollux	244 22.1	+28 08.3
20	Procyon	245 46.3	+ 5 20.6
46	R'alhague	96 47.2	+12 35.4
26	Regulus	208 30.6	+12 11.4
11	Rigel	281 54.9	− 8 15.1
38	Rigil Kent.	140 51.9	−60 39.3
44	Sabik	103 03.0	−15 40.3
3	Schedar	350 31.4	+56 17.1
45	Shaula	97 21.6	−37 04.4
18	Sirius	259 13.0	−16 39.2
33	Spica	159 17.7	−10 55.6
23	Suhail	223 25.3	−43 15.1
49	Vega	81 08.5	+38 44.3
39	Zub'g'bi	137 54.2	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 6	Moonrise 7	Moonrise 8	Moonrise 9
N °	h m	h m	h m	h m	h m	h m
72	▭	▭	8 04	10 09	12 03	13 55
70	▭	▭	8 24	10 18	12 03	13 47
68	▭	▭	8 39	10 25	12 03	13 40
66	0 47	////	8 52	10 30	12 04	13 35
64	1 45	////	9 02	10 35	12 04	13 31
62	2 18	////	9 11	10 39	12 04	13 27
60	2 42	////	9 18	10 43	12 04	13 23
58	3 01	////	9 25	10 46	12 04	13 20
56	3 17	////	9 31	10 49	12 04	13 18
54	3 30	////	9 36	10 52	12 04	13 15
52	3 42	////	9 41	10 54	12 04	13 13
50	3 53	////	9 45	10 56	12 04	13 11
45	4 14	1 46	9 54	11 00	12 05	13 07
40	4 31	2 31	10 02	11 04	12 05	13 04
35	4 46	3 01	10 08	11 08	12 05	13 01
30	4 58	3 24	10 14	11 10	12 05	12 58
20	5 20	3 57	10 24	11 15	12 05	12 54
10	5 38	4 21	10 32	11 20	12 05	12 50
0	5 55	4 40	10 40	11 24	12 05	12 46
10	6 12	4 57	10 48	11 28	12 06	12 43
20	6 30	5 12	10 57	11 32	12 06	12 39
30	6 50	5 25	11 06	11 37	12 06	12 34
35	7 02	5 32	11 12	11 40	12 06	12 32
40	7 16	5 39	11 18	11 43	12 06	12 29
45	7 32	5 46	11 25	11 47	12 07	12 26
50	7 52	5 53	11 34	11 51	12 07	12 22
52	8 01	5 56	11 38	11 53	12 07	12 20
54	8 12	5 59	11 42	11 55	12 07	12 19
56	8 24	6 03	11 47	11 58	12 07	12 17
58	8 38	6 07	11 53	12 00	12 07	12 14
60 S	8 54	6 10	11 59	12 03	12 08	12 12

Lat.	Sunset	Twlt. ends	Moonset 6	Moonset 7	Moonset 8	Moonset 9
N °	h m	h m	h m	h m	h m	h m
72	▭	▭	1 17	0 44	{0 18 / 23 55}	23 30
70	▭	▭	0 55	0 33	{0 15 / 23 58}	23 41
68	▭	▭	0 38	0 24	0 12	{0 01 / 23 49}
66	23 16	////	0 23	0 16	0 09	{0 03 / 23 56}
64	22 14	////	0 12	0 10	0 07	0 05
62	21 40	////	0 02	0 04	0 05	0 07
60	21 16	////	23 59	24 04	0 04	0 08
58	20 57	////	23 55	24 02	0 02	0 09
56	20 41	////	23 51	24 01	0 01	0 10
54	20 28	////	23 47	24 00	0 00	0 11
52	20 16	////	23 44	23 59	24 12	0 12
50	20 05	////	23 41	23 58	24 13	0 13
45	19 44	22 13	23 35	23 56	24 15	0 15
40	19 26	21 27	23 30	23 54	24 17	0 17
35	19 12	20 58	23 25	23 52	24 18	0 18
30	18 59	20 35	23 21	23 51	24 19	0 19
20	18 38	20 01	23 14	23 48	24 22	0 22
10	18 19	19 36	23 07	23 46	24 23	0 23
0	18 02	19 17	23 01	23 44	24 25	0 25
10	17 46	19 01	22 55	23 42	24 27	0 27
20	17 28	18 46	22 49	23 40	24 29	0 29
30	17 07	18 32	22 41	23 37	24 31	0 31
35	16 55	18 25	22 37	23 35	24 32	0 32
40	16 42	18 19	22 32	23 34	24 33	0 33
45	16 25	18 11	22 26	23 32	24 35	0 35
50	16 05	18 03	22 19	23 29	24 37	0 37
52	15 56	18 01	22 16	23 28	24 38	0 38
54	15 45	17 57	22 13	23 27	24 39	0 39
56	15 33	17 53	22 09	23 25	24 40	0 40
58	15 19	17 50	22 04	23 24	24 41	0 41
60 S	15 03	17 46	21 59	23 22	24 42	0 42

GMT	Equation of Time (App.—Mean) 6	7	8
h	m s	m s	m s
0	+ 1 38.6	+ 1 27.8	+ 1 16.8
6	+ 1 36.0	+ 1 25.1	+ 1 13.9
12	+ 1 33.3	+ 1 22.3	+ 1 11.1
18	+ 1 30.6	+ 1 19.6	+ 1 08.3
24	+ 1 27.8	+ 1 16.8	+ 1 05.4

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
6	16 51	14 16	1 37	13 15	21 09
7	17 34	14 17	1 32	13 12	21 05
8	18 15	14 18	1 28	13 09	21 01
9	18 56	14 20	1 23	13 06	20 57

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
30	0.1	0.1	0.3
45	0.1	0.1	0.2
60	0.1	0.1	0.2
75	0.1	0.0	0.1
90	0.1	0.0	0.0

Moon's Lower Limb **Add**

Alt.	6	7	8
°	′	′	′
0	14.5	13.6	12.9
4	14.5	13.7	12.9
8	14.5	13.7	12.9
12	14.6	13.7	12.9
16	14.6	13.7	13.0
20	14.6	13.8	13.0
24	14.6	13.8	13.1
28	14.6	13.8	13.2
32	14.7	13.9	13.2
36	14.7	14.0	13.3
40	14.7	14.0	13.4
44	14.8	14.1	13.5
48	14.8	14.2	13.6
52	14.9	14.3	13.7
56	14.9	14.3	13.9
60	15.0	14.4	14.0
64	15.0	14.5	14.1
68	15.1	14.6	14.3
72	15.1	14.7	14.4
76	15.2	14.8	14.5
80	15.2	14.9	14.7
84	15.3	15.0	14.8
88	15.3	15.1	14.9
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	6	7	8
°	′	′	′
0	16.1	16.6	17.1
4	16.1	16.6	17.1
8	16.1	16.6	17.0
12	16.1	16.6	17.0
16	16.1	16.6	17.0
20	16.1	16.5	16.9
24	16.1	16.5	16.9
28	16.0	16.4	16.8
32	16.0	16.4	16.7
36	16.0	16.3	16.6
40	15.9	16.3	16.5
44	15.9	16.2	16.4
48	15.8	16.1	16.3
52	15.8	16.0	16.2
56	15.8	15.9	16.1
60	15.7	15.8	16.0
64	15.7	15.8	15.8
68	15.6	15.7	15.7
72	15.6	15.6	15.6
76	15.5	15.5	15.4
80	15.4	15.4	15.3
84	15.4	15.2	15.1
88	15.3	15.2	15.0
90			

Subtract from table, back cover

Pentecost (Whit Sunday)	6
Hebrew Pentecost (Shebuoth)	7
First Quarter	8

GMT	♈ GHA	VENUS −3.4 GHA	VENUS Dec.	MARS −1.9 GHA	MARS Dec.	JUPITER −1.4 GHA	JUPITER Dec.	SATURN 0.6 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
9 0	256 49.7	145 17.1	+23 47.7	339 12.0	−26 32.0	163 03.1	+23 20.0	44 53.6	−10 08.6	83 48.9	163	− 2 18.3	−128
1	271 52.2	160 16.3	47.3	354 15.0	32.2	178 05.0	20.0	59 56.1	08.6	98 24.2	162	2 31.1	−127
2	286 54.6	175 15.5	46.9	9 18.0	32.4	193 06.9	20.0	74 58.7	08.6	112 59.4	163	2 43.8	−128
3	301 57.1	190 14.8	•• 46.5	24 21.1	•• 32.6	208 08.7	•• 20.0	90 01.3	•• 08.6	127 34.7	163	• 2 56.6	−127
4	316 59.6	205 14.0	46.1	39 24.1	32.8	223 10.6	20.0	105 03.8	08.5	142 10.0	162	3 09.3	−127
5	332 02.0	220 13.3	45.7	54 27.1	33.0	238 12.4	20.0	120 06.4	08.5	156 45.2	163	3 22.0	−127
6	347 04.5	235 12.5	+23 45.3	69 30.1	−26 33.2	253 14.3	+23 20.0	135 09.0	−10 08.5	171 20.5	163	− 3 34.7	−127
7	2 06.9	250 11.7	44.9	84 33.1	33.4	268 16.1	20.0	150 11.5	08.4	185 55.8	163	3 47.4	−126
8	17 09.4	265 11.0	44.5	99 36.2	33.6	283 18.0	20.0	165 14.1	08.4	200 31.1	163	4 00.0	−126
9	32 11.9	280 10.2	•• 44.1	114 39.2	•• 33.8	298 19.8	•• 19.9	180 16.7	•• 08.4	215 06.4	163	• 4 12.6	−126
10	47 14.3	295 09.4	43.7	129 42.2	34.0	313 21.7	19.9	195 19.3	08.4	229 41.7	162	4 25.2	−126
11	62 16.8	310 08.7	43.3	144 45.2	34.2	328 23.6	19.9	210 21.8	08.3	244 16.9	163	4 37.8	−126
12	77 19.3	325 07.9	+23 42.9	159 48.3	−26 34.4	343 25.4	+23 19.9	225 24.4	−10 08.3	258 52.2	163	− 4 50.4	−125
13	92 21.7	340 07.2	42.5	174 51.3	34.6	358 27.3	19.9	240 27.0	08.3	273 27.5	163	5 02.9	−125
14	107 24.2	355 06.4	42.1	189 54.3	34.8	13 29.1	19.9	255 29.5	08.3	288 02.8	162	5 15.4	−125
15	122 26.7	10 05.6	•• 41.6	204 57.4	•• 35.0	28 31.0	•• 19.9	270 32.1	•• 08.2	302 38.0	163	• 5 27.9	−125
16	137 29.1	25 04.9	41.2	220 00.4	35.2	43 32.8	19.9	285 34.7	08.2	317 13.3	163	5 40.4	−124
17	152 31.6	40 04.1	40.8	235 03.4	35.4	58 34.7	19.9	300 37.2	08.2	331 48.6	162	5 52.8	−124
18	167 34.1	55 03.4	+23 40.4	250 06.5	−26 35.6	73 36.5	+23 19.8	315 39.8	−10 08.1	346 23.8	162	− 6 05.2	−124
19	182 36.5	70 02.6	40.0	265 09.5	35.8	88 38.4	19.8	330 42.4	08.1	0 59.0	163	6 17.6	−123
20	197 39.0	85 01.9	39.6	280 12.6	36.0	103 40.3	19.8	345 44.9	08.1	15 34.3	162	6 29.9	−123
21	212 41.4	100 01.1	•• 39.1	295 15.6	•• 36.2	118 42.1	•• 19.8	0 47.5	•• 08.1	30 09.5	162	• 6 42.2	−123
22	227 43.9	115 00.3	38.7	310 18.6	36.4	133 44.0	19.8	15 50.1	08.0	44 44.7	162	6 54.5	−123
23	242 46.4	129 59.6	38.3	325 21.7	36.6	148 45.8	19.8	30 52.6	08.0	59 19.9	161	7 06.8	−122
10 0	257 48.8	144 58.8	+23 37.9	340 24.7	−26 36.8	163 47.7	+23 19.8	45 55.2	−10 08.0	73 55.0	162	− 7 19.0	−122
1	272 51.3	159 58.1	37.5	355 27.8	37.0	178 49.5	19.8	60 57.8	08.0	88 30.2	161	7 31.2	−121
2	287 53.8	174 57.3	37.0	10 30.8	37.2	193 51.4	19.8	76 00.3	07.9	103 05.3	161	7 43.3	−122
3	302 56.2	189 56.6	•• 36.6	25 33.9	•• 37.4	208 53.2	•• 19.7	91 02.9	•• 07.9	117 40.4	161	• 7 55.5	−121
4	317 58.7	204 55.8	36.2	40 36.9	37.6	223 55.1	19.7	106 05.5	07.9	132 15.5	161	8 07.6	−120
5	333 01.2	219 55.1	35.7	55 40.0	37.8	238 57.0	19.7	121 08.0	07.9	146 50.6	161	8 19.6	−121
6	348 03.6	234 54.3	+23 35.3	70 43.0	−26 38.0	253 58.8	+23 19.7	136 10.6	−10 07.8	161 25.7	160	− 8 31.7	−119
7	3 06.1	249 53.6	34.9	85 46.1	38.2	269 00.7	19.7	151 13.2	07.8	176 00.7	160	8 43.6	−120
8	18 08.6	264 52.8	34.4	100 49.1	38.4	284 02.5	19.7	166 15.7	07.8	190 35.7	160	8 55.6	−119
9	33 11.0	279 52.1	•• 34.0	115 52.2	•• 38.6	299 04.4	•• 19.7	181 18.3	•• 07.8	205 10.7	160	• 9 07.5	−119
10	48 13.5	294 51.3	33.6	130 55.2	38.8	314 06.2	19.7	196 20.9	07.7	219 45.7	160	9 19.4	−118
11	63 15.9	309 50.6	33.1	145 58.3	39.0	329 08.1	19.6	211 23.4	07.7	234 20.7	159	9 31.2	−118
12	78 18.4	324 49.8	+23 32.7	161 01.3	−26 39.2	344 09.9	+23 19.6	226 26.0	−10 07.7	248 55.6	159	− 9 43.0	−118
13	93 20.9	339 49.1	32.3	176 04.4	39.4	359 11.8	19.6	241 28.5	07.7	263 30.5	158	9 54.8	−117
14	108 23.3	354 48.3	31.8	191 07.5	39.5	14 13.7	19.6	256 31.1	07.6	278 05.3	159	10 06.5	−117
15	123 25.8	9 47.6	•• 31.4	206 10.5	•• 39.7	29 15.5	•• 19.6	271 33.7	•• 07.6	292 40.2	158	•10 18.2	−117
16	138 28.3	24 46.8	30.9	221 13.6	39.9	44 17.4	19.6	286 36.2	07.6	307 15.0	158	10 29.9	−116
17	153 30.7	39 46.1	30.5	236 16.7	40.1	59 19.2	19.6	301 38.8	07.5	321 49.8	157	10 41.5	−115
18	168 33.2	54 45.3	+23 30.1	251 19.7	−26 40.3	74 21.1	+23 19.6	316 41.4	−10 07.5	336 24.5	157	−10 53.0	−115
19	183 35.7	69 44.6	29.6	266 22.8	40.5	89 22.9	19.5	331 43.9	07.5	350 59.2	157	11 04.5	−115
20	198 38.1	84 43.8	29.2	281 25.9	40.7	104 24.8	19.5	346 46.5	07.5	5 33.9	157	11 16.0	−114
21	213 40.6	99 43.1	•• 28.7	296 28.9	•• 40.9	119 26.6	•• 19.5	1 49.1	•• 07.4	20 08.6	156	•11 27.4	−114
22	228 43.0	114 42.3	28.3	311 32.0	41.1	134 28.5	19.5	16 51.6	07.4	34 43.2	156	11 38.8	−114
23	243 45.5	129 41.6	27.8	326 35.1	41.3	149 30.3	19.5	31 54.2	07.4	49 17.8	155	11 50.2	−112
11 0	258 48.0	144 40.9	+23 27.4	341 38.1	−26 41.5	164 32.2	+23 19.5	46 56.7	−10 07.4	63 52.3	155	−12 01.4	−113
1	273 50.4	159 40.1	26.9	356 41.2	41.7	179 34.1	19.5	61 59.3	07.3	78 26.8	155	12 12.7	−112
2	288 52.9	174 39.4	26.5	11 44.3	41.9	194 35.9	19.5	77 01.9	07.3	93 01.3	154	12 23.9	−111
3	303 55.4	189 38.6	•• 26.0	26 47.4	•• 42.1	209 37.8	•• 19.5	92 04.4	•• 07.3	107 35.7	154	•12 35.0	−111
4	318 57.8	204 37.9	25.5	41 50.5	42.3	224 39.6	19.4	107 07.0	07.3	122 10.1	154	12 46.1	−111
5	334 00.3	219 37.2	25.1	56 53.5	42.5	239 41.5	19.4	122 09.6	07.2	136 44.5	153	12 57.2	−110
6	349 02.8	234 36.4	+23 24.6	71 56.6	−26 42.7	254 43.3	+23 19.4	137 12.1	−10 07.2	151 18.8	152	−13 08.2	−109
7	4 05.2	249 35.7	24.2	86 59.7	42.9	269 45.2	19.4	152 14.7	07.2	165 53.0	153	13 19.1	−109
8	19 07.7	264 34.9	23.7	102 02.8	43.1	284 47.0	19.4	167 17.2	07.2	180 27.3	151	13 30.0	−108
9	34 10.2	279 34.2	•• 23.3	117 05.9	•• 43.3	299 48.9	•• 19.4	182 19.8	•• 07.1	195 01.4	152	•13 40.8	−108
10	49 12.6	294 33.5	22.8	132 08.9	43.5	314 50.7	19.4	197 22.4	07.1	209 35.6	151	13 51.6	−108
11	64 15.1	309 32.7	22.3	147 12.0	43.7	329 52.6	19.3	212 24.9	07.1	224 09.7	150	14 02.4	−106
12	79 17.5	324 32.0	+23 21.9	162 15.1	−26 43.9	344 54.4	+23 19.3	227 27.5	−10 07.1	238 43.7	150	−14 13.0	−107
13	94 20.0	339 31.2	21.4	177 18.2	44.1	359 56.3	19.3	242 30.1	07.0	253 17.7	150	14 23.7	−105
14	109 22.5	354 30.5	20.9	192 21.3	44.3	14 58.2	19.3	257 32.6	07.0	267 51.7	149	14 34.2	−105
15	124 24.9	9 29.8	•• 20.5	207 24.4	•• 44.5	30 00.0	•• 19.3	272 35.2	•• 07.0	282 25.6	148	•14 44.7	−105
16	139 27.4	24 29.0	20.0	222 27.5	44.7	45 01.9	19.3	287 37.7	07.0	296 59.4	149	14 55.2	−104
17	154 29.9	39 28.3	19.5	237 30.6	44.9	60 03.7	19.3	302 40.3	07.0	311 33.3	147	15 05.6	−103
18	169 32.3	54 27.6	+23 19.0	252 33.7	−26 45.1	75 05.6	+23 19.3	317 42.9	−10 06.9	326 07.0	147	−15 15.9	−103
19	184 34.8	69 26.8	18.6	267 36.8	45.3	90 07.4	19.2	332 45.4	06.9	340 40.7	147	15 26.2	−102
20	199 37.3	84 26.1	18.1	282 39.9	45.5	105 09.3	19.2	347 48.0	06.9	355 14.4	146	15 36.4	−102
21	214 39.7	99 25.4	•• 17.6	297 43.0	•• 45.7	120 11.1	•• 19.2	2 50.5	•• 06.9	9 48.0	146	•15 46.6	−100
22	229 42.2	114 24.6	17.2	312 46.1	45.9	135 13.0	19.2	17 53.1	06.8	24 21.6	145	15 56.6	−101
23	244 44.7	129 23.9	16.7	327 49.2	46.1	150 14.8	19.2	32 55.7	06.8	38 55.1	144	16 06.7	− 99
24	259 47.1	144 23.2	+23 16.2	342 52.3	−26 46.3	165 16.7	+23 19.2	47 58.2	−10 06.8	53 28.5	144	−16 16.6	− 99
code	—	− 7	− 4	+ 31	− 2	+ 19	0	+ 25	0				

GMT		SUN GHA		SUN Dec.	
d	h	° ′		° ′	
9	0	180 16.3		+22 52.2	
	1	195 16.2		52.4	
	2	210 16.1		52.6	
	3	225 15.9	••	52.9	
	4	240 15.8		53.1	
	5	255 15.7		53.3	
	6	270 15.6		+22 53.5	
	7	285 15.5		53.7	
	8	300 15.3		53.9	
	9	315 15.2	••	54.2	
	10	330 15.1		54.4	
	11	345 15.0		54.6	
	12	0 14.9		+22 54.8	
	13	15 14.7		55.0	
	14	30 14.6		55.2	
	15	45 14.5	••	55.4	
	16	60 14.4		55.7	
	17	75 14.2		55.9	
	18	90 14.1		+22 56.1	
	19	105 14.0		56.3	
	20	120 13.9		56.5	
	21	135 13.8	••	56.7	
	22	150 13.6		56.9	
	23	165 13.5		57.1	
10	0	180 13.4		+22 57.3	
	1	195 13.3		57.5	
	2	210 13.1		57.7	
	3	225 13.0	••	57.9	
	4	240 12.9		58.1	
	5	255 12.8		58.3	
	6	270 12.7		+22 58.5	
	7	285 12.5		58.7	
	8	300 12.4		58.9	
	9	315 12.3	••	59.1	
	10	330 12.2		59.3	
	11	345 12.0		59.5	
	12	0 11.9		+22 59.7	
	13	15 11.8		22 59.9	
	14	30 11.7		23 00.1	
	15	45 11.6	••	00.3	
	16	60 11.4		00.5	
	17	75 11.3		00.7	
	18	90 11.2		+23 00.9	
	19	105 11.1		01.1	
	20	120 10.9		01.3	
	21	135 10.8	••	01.4	
	22	150 10.7		01.6	
	23	165 10.6		01.8	
11	0	180 10.4		+23 02.0	
	1	195 10.3		02.2	
	2	210 10.2		02.4	
	3	225 10.1	••	02.6	
	4	240 09.9		02.8	
	5	255 09.8		02.9	
	6	270 09.7		+23 03.1	
	7	285 09.6		03.3	
	8	300 09.4		03.5	
	9	315 09.3	••	03.7	
	10	330 09.2		03.8	
	11	345 09.1		04.0	
	12	0 08.9		+23 04.2	
	13	15 08.8		04.4	
	14	30 08.7		04.6	
	15	45 08.6	••	04.7	
	16	60 08.4		04.9	
	17	75 08.3		05.1	
	18	90 08.2		+23 05.3	
	19	105 08.1		05.4	
	20	120 07.9		05.6	
	21	135 07.8	••	05.8	
	22	150 07.7		06.0	
	23	165 07.6		06.1	
	24	180 07.4		+23 06.3	
code		—		+ 2	

STARS

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 52.2	−40 29.0
5	Achernar	335 59.8	−57 27.7
30	Acrux	173 58.8	−62 51.2
19	Adhara	255 47.7	−28 54.6
10	Aldebaran	291 40.5	+16 25.2
32	Alioth	166 59.1	+56 12.5
34	Alkaid	153 33.3	+49 32.5
55	Al Na'ir	28 38.9	−47 10.7
15	Alnilam	276 31.6	− 1 13.7
25	Alphard	218 39.7	− 8 27.7
41	Alphecca	126 48.1	+26 52.0
1	Alpheratz	358 29.4	+28 50.3
51	Altair	62 51.1	+ 8 44.8
2	Ankaa	353 59.3	−42 32.9
42	Antares	113 20.2	−26 20.1
37	Arcturus	146 35.8	+19 25.1
43	Atria	109 01.3	−68 57.0
22	Avior	234 36.7	−59 22.0
13	Bellatrix	279 19.8	+ 6 18.6
16	Betelg'se	271 49.5	+ 7 24.0
17	Canopus	264 16.3	−52 40.3
12	Capella	281 40.4	+45 57.3
53	Deneb	50 01.4	+45 06.9
28	Denebola	183 18.7	+14 49.6
4	Diphda	349 40.3	−18 14.0
27	Dubhe	194 45.7	+62 00.0
14	Elnath	279 09.0	+28 34.3
47	Eltanin	91 06.2	+51 29.5
54	Enif	34 30.4	+ 9 39.9
56	Fomalhaut	16 12.6	−29 51.6
31	Gacrux	172 50.2	−56 51.9
29	Gienah	176 37.8	−17 17.6
35	Hadar	149 50.4	−60 09.6
6	Hamal	328 51.0	+23 14.9
48	Kaus Aust.	84 42.1	−34 24.5
40	Kochab	137 16.7	+74 20.6
57	Markab	14 22.4	+14 57.6
8	Menkar	315 01.6	+ 3 54.8
36	Menkent	148 59.6	−36 09.1
24	Miapl'dus	221 49.9	−69 32.1
9	Mirfak	309 44.3	+49 42.0
50	Nunki	76 52.7	−26 21.3
52	Peacock	54 28.3	−56 52.8
21	Pollux	244 22.1	+28 08.3
20	Procyon	245 46.3	+ 5 20.6
46	R'alhague	96 47.2	+12 35.4
26	Regulus	208 30.6	+12 11.4
11	Rigel	281 54.9	− 8 15.1
38	Rigil Kent.	140 51.9	−60 39.3
44	Sabik	103 02.9	−15 40.3
3	Schedar	350 31.4	+56 17.1
45	Shaula	97 21.6	−37 04.4
18	Sirius	259 13.0	−16 39.2
33	Spica	159 17.7	−10 55.6
23	Suhail	223 25.3	−43 15.1
49	Vega	81 08.5	+38 44.3
39	Zub'g'bi	137 54.2	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 9	Moonrise 10	Moonrise 11	Moonrise 12
°	h m	h m	h m	h m	h m	h m
N 72	▭	▭	13 55	15 51	18 07	■
70	▭	▭	13 47	15 33	17 29	20 07
68	▭	▭	13 40	15 19	17 03	19 01
66	0 31	////	13 35	15 07	16 43	18 26
64	1 40	////	13 31	14 58	16 27	18 01
62	2 14	////	13 27	14 50	16 14	17 41
60	2 39	////	13 23	14 43	16 03	17 25
58	2 59	////	13 20	14 37	15 54	17 11
56	3 15	////	13 18	14 31	15 45	17 00
54	3 29	////	13 15	14 26	15 38	16 50
52	3 41	////	13 13	14 22	15 31	16 41
50	3 51	////	13 11	14 18	15 25	16 33
45	4 13	1 43	13 07	14 10	15 12	16 16
40	4 31	2 29	13 04	14 03	15 02	16 02
35	4 45	3 00	13 01	13 57	14 53	15 50
30	4 58	3 22	12 58	13 51	14 45	15 40
20	5 20	3 56	12 54	13 42	14 32	15 23
10	5 38	4 21	12 50	13 35	14 20	15 07
0	5 56	4 40	12 46	13 27	14 09	14 53
10	6 13	4 58	12 43	13 20	13 58	14 39
20	6 31	5 13	12 39	13 12	13 47	14 24
30	6 52	5 26	12 34	13 03	13 34	14 08
35	7 04	5 33	12 32	12 58	13 26	13 58
40	7 18	5 40	12 29	12 53	13 18	13 46
45	7 34	5 47	12 26	12 46	13 08	13 33
50	7 54	5 55	12 22	12 38	12 56	13 17
52	8 04	5 58	12 20	12 35	12 51	13 10
54	8 15	6 02	12 19	12 31	12 45	13 02
56	8 27	6 05	12 17	12 26	12 38	12 53
58	8 41	6 09	12 14	12 22	12 30	12 42
60	8 58	6 13	12 12	12 16	12 22	12 30
S						

Lat.	Sunset	Twlt. ends	Moonset 9	Moonset 10	Moonset 11	Moonset 12
°	h m	h m	h m	h m	h m	h m
N 72	▭	▭	23 30	23 01	22 13	■
70	▭	▭	23 41	23 21	22 53	21 47
68	▭	▭	{0 01 / 23 49}	23 36	23 20	22 54
66	23 34	////	{0 03 / 23 56}	23 49	23 41	23 31
64	22 20	////	0 05	0 02	{0 00 / 23 58}	23 57
62	21 45	////	0 07	0 08	0 09	0 12
60	21 20	////	0 08	0 12	0 17	0 24
58	21 00	////	0 09	0 16	0 24	0 34
56	20 44	////	0 10	0 20	0 30	0 43
54	20 30	////	0 11	0 23	0 36	0 51
52	20 18	////	0 12	0 26	0 41	0 58
50	20 08	////	0 13	0 29	0 46	1 05
45	19 46	22 16	0 15	0 35	0 56	1 19
40	19 28	21 30	0 17	0 40	1 04	1 31
35	19 13	20 59	0 18	0 44	1 11	1 41
30	19 00	20 36	0 19	0 48	1 17	1 49
20	18 39	20 03	0 22	0 54	1 28	2 04
10	18 20	19 37	0 23	1 00	1 38	2 18
0	18 03	19 18	0 25	1 06	1 47	2 30
10	17 46	19 01	0 27	1 11	1 56	2 43
20	17 28	18 46	0 29	1 17	2 06	2 56
30	17 07	18 32	0 31	1 24	2 17	3 11
35	16 55	18 25	0 32	1 28	2 24	3 21
40	16 41	18 18	0 33	1 32	2 31	3 31
45	16 25	18 11	0 35	1 37	2 40	3 43
50	16 04	18 03	0 37	1 44	2 50	3 58
52	15 55	18 00	0 38	1 46	2 55	4 04
54	15 44	17 57	0 39	1 50	3 01	4 12
56	15 32	17 53	0 40	1 53	3 07	4 21
58	15 17	17 49	0 41	1 57	3 13	4 31
60	15 00	17 44	0 42	2 01	3 21	4 42
S						

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.1	0.1	0.3
30	0.1	0.1	0.2
45	0.1	0.1	0.2
60	0.1	0.0	0.1
75	0.1	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	9	10	11
°	′	′	′
0	12.4	12.0	11.9
4	12.4	12.0	11.9
8	12.4	12.0	11.9
12	12.4	12.1	11.9
16	12.5	12.1	12.0
20	12.6	12.2	12.1
24	12.6	12.3	12.2
28	12.7	12.4	12.2
32	12.8	12.5	12.4
36	12.9	12.6	12.5
40	13.0	12.7	12.6
44	13.1	12.8	12.7
48	13.3	13.0	12.9
52	13.4	13.1	13.1
56	13.5	13.3	13.2
60	13.7	13.5	13.4
64	13.9	13.6	13.6
68	14.0	13.8	13.8
72	14.2	14.0	14.0
76	14.4	14.2	14.2
80	14.5	14.4	14.4
84	14.7	14.6	14.6
88	14.8	14.7	14.7
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	9	10	11
°	′	′	′
0	17.4	17.6	17.7
4	17.4	17.6	17.6
8	17.3	17.5	17.6
12	17.3	17.5	17.6
16	17.2	17.5	17.5
20	17.2	17.4	17.5
24	17.1	17.3	17.4
28	17.0	17.2	17.3
32	16.9	17.1	17.2
36	16.8	17.0	17.0
40	16.7	16.9	16.9
44	16.6	16.7	16.8
48	16.5	16.6	16.6
52	16.3	16.4	16.5
56	16.2	16.3	16.3
60	16.0	16.1	16.1
64	15.9	15.9	15.9
68	15.7	15.7	15.8
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.2	15.2	15.2
84	15.0	15.0	15.0
88	14.9	14.8	14.8
90			

Subtract from table, back cover

Equation of Time (App.—Mean)

GMT	9	10	11
h	m s	m s	m s
0	+ 1 05.4	+ 0 53.8	+ 0 42.0
6	+ 1 02.5	+ 0 50.9	+ 0 39.0
12	+ 0 59.7	+ 0 47.9	+ 0 36.0
18	+ 0 56.7	+ 0 45.0	+ 0 33.0
24	+ 0 53.8	+ 0 42.0	+ 0 30.0

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
9	18 56	14 20	1 23	13 06	20 57
10	19 37	14 21	1 18	13 03	20 53
11	20 20	14 22	1 13	13 00	20 49
12	21 04	14 23	1 08	12 57	20 45

992941°—53——7

GMT	♈ GHA	VENUS −3.4 GHA	VENUS Dec.	MARS −2.0 GHA	MARS Dec.	JUPITER −1.4 GHA	JUPITER Dec.	SATURN 0.6 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
12 0	259 47.1	144 23.2	+23 16.2	342 52.3	−26 46.3	165 16.7	+23 19.2	47 58.2	−10 06.8	53 28.5	144	−16 16.6	−99
1	274 49.6	159 22.4	15.7	357 55.4	46.5	180 18.6	19.2	63 00.8	06.8	68 01.9	143	16 26.5	−99
2	289 52.0	174 21.7	15.2	12 58.5	46.7	195 20.4	19.2	78 03.3	06.7	82 35.2	143	16 36.4	−97
3	304 54.5	189 21.0	•• 14.8	28 01.6	•• 46.9	210 22.3	•• 19.1	93 05.9	•• 06.7	97 08.5	143	·16 46.1	−97
4	319 57.0	204 20.3	14.3	43 04.7	47.1	225 24.1	19.1	108 08.5	06.7	111 41.8	141	16 55.8	−97
5	334 59.4	219 19.5	13.8	58 07.8	47.3	240 26.0	19.1	123 11.0	06.7	126 14.9	142	17 05.5	−95
6	350 01.9	234 18.8	+23 13.3	73 10.9	−26 47.5	255 27.8	+23 19.1	138 13.6	−10 06.6	140 48.1	140	−17 15.0	−95
7	5 04.4	249 18.1	12.8	88 14.0	47.7	270 29.7	19.1	153 16.1	06.6	155 21.1	140	17 24.5	−94
8	20 06.8	264 17.3	12.3	103 17.1	47.8	285 31.5	19.1	168 18.7	06.6	169 54.1	140	17 33.9	−94
9	35 09.3	279 16.6	•• 11.8	118 20.2	•• 48.0	300 33.4	•• 19.1	183 21.3	•• 06.6	184 27.1	139	·17 43.3	−93
10	50 11.8	294 15.9	11.4	133 23.3	48.2	315 35.2	19.0	198 23.8	06.6	199 00.0	138	17 52.6	−92
11	65 14.2	309 15.2	10.9	148 26.4	48.4	330 37.1	19.0	213 26.4	06.5	213 32.8	138	18 01.8	−91
12	80 16.7	324 14.4	+23 10.4	163 29.6	−26 48.6	345 38.9	+23 19.0	228 28.9	−10 06.5	228 05.6	137	−18 10.9	−91
13	95 19.1	339 13.7	09.9	178 32.7	48.8	0 40.8	19.0	243 31.5	06.5	242 38.3	136	18 20.0	−90
14	110 21.6	354 13.0	09.4	193 35.8	49.0	15 42.6	19.0	258 34.0	06.5	257 10.9	136	18 29.0	−89
15	125 24.1	9 12.3	•• 08.9	208 38.9	•• 49.2	30 44.5	•• 19.0	273 36.6	•• 06.4	271 43.5	136	·18 37.9	−88
16	140 26.5	24 11.5	08.4	223 42.0	49.4	45 46.4	19.0	288 39.2	06.4	286 16.1	134	18 46.7	−88
17	155 29.0	39 10.8	07.9	238 45.1	49.6	60 48.2	18.9	303 41.7	06.4	300 48.5	134	18 55.5	−87
18	170 31.5	54 10.1	+23 07.4	253 48.3	−26 49.8	75 50.1	+23 18.9	318 44.3	−10 06.4	315 20.9	134	−19 04.2	−86
19	185 33.9	69 09.4	06.9	268 51.4	50.0	90 51.9	18.9	333 46.8	06.3	329 53.3	132	19 12.8	−85
20	200 36.4	84 08.7	06.4	283 54.5	50.2	105 53.8	18.9	348 49.4	06.3	344 25.5	133	19 21.3	−85
21	215 38.9	99 07.9	•• 05.9	298 57.6	•• 50.4	120 55.6	•• 18.9	3 51.9	•• 06.3	358 57.8	131	·19 29.8	−83
22	230 41.3	114 07.2	05.4	314 00.8	50.6	135 57.5	18.9	18 54.5	06.3	13 29.9	131	19 38.1	−83
23	245 43.8	129 06.5	04.9	329 03.9	50.8	150 59.3	18.9	33 57.1	06.3	28 02.0	131	19 46.4	−82
13 0	260 46.3	144 05.8	+23 04.4	344 07.0	−26 51.0	166 01.2	+23 18.8	48 59.6	−10 06.2	42 34.1	129	−19 54.6	−81
1	275 48.7	159 05.1	03.9	359 10.1	51.2	181 03.0	18.8	64 02.2	06.2	57 06.0	129	20 02.7	−80
2	290 51.2	174 04.3	03.4	14 13.3	51.4	196 04.9	18.8	79 04.7	06.2	71 37.9	129	20 10.7	−80
3	305 53.6	189 03.6	•• 02.9	29 16.4	•• 51.6	211 06.7	•• 18.8	94 07.3	•• 06.2	86 09.8	127	·20 18.7	−78
4	320 56.1	204 02.9	02.4	44 19.5	51.8	226 08.6	18.8	109 09.8	06.1	100 41.5	128	20 26.5	−78
5	335 58.6	219 02.2	01.9	59 22.7	52.0	241 10.4	18.8	124 12.4	06.1	115 13.3	126	20 34.3	−77
6	351 01.0	234 01.5	+23 01.3	74 25.8	−26 52.2	256 12.3	+23 18.8	139 15.0	−10 06.1	129 44.9	126	−20 42.0	−76
7	6 03.5	249 00.8	00.8	89 28.9	52.4	271 14.1	18.7	154 17.5	06.1	144 16.5	125	20 49.6	−75
8	21 06.0	264 00.0	23 00.3	104 32.1	52.6	286 16.0	18.7	169 20.1	06.1	158 48.0	125	20 57.1	−74
9	36 08.4	278 59.3	·22 59.8	119 35.2	•• 52.7	301 17.9	•• 18.7	184 22.6	•• 06.0	173 19.5	123	·21 04.5	−73
10	51 10.9	293 58.6	59.3	134 38.3	52.9	316 19.7	18.7	199 25.2	06.0	187 50.8	124	21 11.8	−73
11	66 13.4	308 57.9	58.8	149 41.5	53.1	331 21.6	18.7	214 27.7	06.0	202 22.2	122	21 19.1	−71
12	81 15.8	323 57.2	+22 58.3	164 44.6	−26 53.3	346 23.4	+23 18.7	229 30.3	−10 06.0	216 53.4	122	−21 26.2	−71
13	96 18.3	338 56.5	57.7	179 47.8	53.5	1 25.3	18.7	244 32.8	05.9	231 24.6	122	21 33.3	−69
14	111 20.8	353 55.8	57.2	194 50.9	53.7	16 27.1	18.6	259 35.4	05.9	245 55.8	120	21 40.2	−69
15	126 23.2	8 55.0	•• 56.7	209 54.1	•• 53.9	31 29.0	•• 18.6	274 37.9	•• 05.9	260 26.8	120	·21 47.1	−67
16	141 25.7	23 54.3	56.2	224 57.2	54.1	46 30.8	18.6	289 40.5	05.9	274 57.8	120	21 53.8	−67
17	156 28.1	38 53.6	55.7	240 00.3	54.3	61 32.7	18.6	304 43.1	05.9	289 28.8	118	22 00.5	−66
18	171 30.6	53 52.9	+22 55.1	255 03.5	−26 54.5	76 34.5	+23 18.6	319 45.6	−10 05.8	303 59.6	119	−22 07.1	−64
19	186 33.1	68 52.2	54.6	270 06.6	54.7	91 36.4	18.6	334 48.2	05.8	318 30.5	117	22 13.5	−64
20	201 35.5	83 51.5	54.1	285 09.8	54.9	106 38.2	18.5	349 50.7	05.8	333 01.2	117	22 19.9	−63
21	216 38.0	98 50.8	•• 53.6	300 12.9	•• 55.1	121 40.1	•• 18.5	4 53.3	•• 05.8	347 31.9	116	·22 26.2	−61
22	231 40.5	113 50.1	53.0	315 16.1	55.3	136 41.9	18.5	19 55.8	05.7	2 02.5	116	22 32.3	−61
23	246 42.9	128 49.4	52.5	330 19.2	55.5	151 43.8	18.5	34 58.4	05.7	16 33.1	115	22 38.4	−60
14 0	261 45.4	143 48.7	+22 52.0	345 22.4	−26 55.7	166 45.6	+23 18.5	50 00.9	−10 05.7	31 03.6	114	−22 44.4	−58
1	276 47.9	158 48.0	51.4	0 25.6	55.9	181 47.5	18.5	65 03.5	05.7	45 34.0	114	22 50.2	−58
2	291 50.3	173 47.3	50.9	15 28.7	56.1	196 49.3	18.5	80 06.0	05.7	60 04.4	113	22 56.0	−56
3	306 52.8	188 46.6	•• 50.4	30 31.9	•• 56.2	211 51.2	•• 18.4	95 08.6	•• 05.6	74 34.7	112	·23 01.6	−56
4	321 55.3	203 45.9	49.8	45 35.0	56.4	226 53.1	18.4	110 11.1	05.6	89 04.9	112	23 07.2	−54
5	336 57.7	218 45.1	49.3	60 38.2	56.6	241 54.9	18.4	125 13.7	05.6	103 35.1	111	23 12.6	−53
6	352 00.2	233 44.4	+22 48.8	75 41.3	−26 56.8	256 56.8	+23 18.4	140 16.2	−10 05.6	118 05.2	111	−23 17.9	−53
7	7 02.6	248 43.7	48.2	90 44.5	57.0	271 58.6	18.4	155 18.8	05.6	132 35.3	110	23 23.2	−51
8	22 05.1	263 43.0	47.7	105 47.7	57.2	287 00.5	18.4	170 21.3	05.5	147 05.3	109	23 28.3	−50
9	37 07.6	278 42.3	•• 47.1	120 50.8	•• 57.4	302 02.3	•• 18.3	185 23.9	•• 05.5	161 35.2	109	·23 33.3	−49
10	52 10.0	293 41.6	46.6	135 54.0	57.6	317 04.2	18.3	200 26.4	05.5	176 05.1	108	23 38.2	−48
11	67 12.5	308 40.9	46.1	150 57.2	57.8	332 06.0	18.3	215 29.0	05.5	190 34.9	108	23 43.0	−46
12	82 15.0	323 40.2	+22 45.5	166 00.3	−26 58.0	347 07.9	+23 18.3	230 31.6	−10 05.5	205 04.7	107	−23 47.6	−46
13	97 17.4	338 39.5	45.0	181 03.5	58.2	2 09.7	18.3	245 34.1	05.4	219 34.4	107	23 52.2	−44
14	112 19.9	353 38.8	44.4	196 06.7	58.4	17 11.6	18.3	260 36.7	05.4	234 04.1	106	23 56.6	−44
15	127 22.4	8 38.1	•• 43.9	211 09.8	•• 58.6	32 13.4	•• 18.3	275 39.2	•• 05.4	248 33.7	105	·24 01.0	−42
16	142 24.8	23 37.4	43.3	226 13.0	58.8	47 15.3	18.2	290 41.8	05.4	263 03.2	105	24 05.2	−41
17	157 27.3	38 36.7	42.8	241 16.2	59.0	62 17.1	18.2	305 44.3	05.4	277 32.7	105	24 09.3	−40
18	172 29.8	53 36.0	+22 42.2	256 19.3	−26 59.1	77 19.0	+23 18.2	320 46.9	−10 05.3	292 02.2	103	−24 13.3	−38
19	187 32.2	68 35.4	41.7	271 22.5	59.3	92 20.8	18.2	335 49.4	05.3	306 31.5	104	24 17.1	−38
20	202 34.7	83 34.7	41.1	286 25.7	59.5	107 22.7	18.2	350 52.0	05.3	321 00.9	102	24 20.9	−36
21	217 37.1	98 34.0	•• 40.6	301 28.9	•• 59.7	122 24.5	•• 18.2	5 54.5	•• 05.3	335 30.1	103	·24 24.5	−36
22	232 39.6	113 33.3	40.0	316 32.0	26 59.9	137 26.4	18.1	20 57.1	05.3	349 59.4	101	24 28.1	−33
23	247 42.1	128 32.6	39.5	331 35.2	27 00.1	152 28.2	18.1	35 59.6	05.2	4 28.5	102	24 31.4	−33
24	262 44.5	143 31.9	+22 38.9	346 38.4	−27 00.3	167 30.1	+23 18.1	51 02.2	−10 05.2	18 57.7	100	−24 34.7	−32
code	—	−7	−6	+32	−2	+19	0	+25	+1				

GMT		SUN GHA	SUN Dec.
	h	° ′	° ′
12	0	180 07.4	+23 06.3
	1	195 07.3	06.5
	2	210 07.2	06.6
	3	225 07.1 ••	06.8
	4	240 06.9	07.0
	5	255 06.8	07.2
	6	270 06.7	+23 07.3
	7	285 06.5	07.5
	8	300 06.4	07.6
	9	315 06.3 ••	07.8
	10	330 06.2	08.0
	11	345 06.0	08.1
	12	0 05.9	+23 08.3
	13	15 05.8	08.5
	14	30 05.7	08.6
	15	45 05.5 ••	08.8
	16	60 05.4	08.9
	17	75 05.3	09.1
	18	90 05.1	+23 09.3
	19	105 05.0	09.4
	20	120 04.9	09.6
	21	135 04.8 ••	09.7
	22	150 04.6	09.9
	23	165 04.5	10.0
13	0	180 04.4	+23 10.2
	1	195 04.2	10.3
	2	210 04.1	10.5
	3	225 04.0 ••	10.7
	4	240 03.9	10.8
	5	255 03.7	11.0
	6	270 03.6	+23 11.1
	7	285 03.5	11.3
	8	300 03.3	11.4
	9	315 03.2 ••	11.6
	10	330 03.1	11.7
	11	345 03.0	11.8
	12	0 02.8	+23 12.0
	13	15 02.7	12.1
	14	30 02.6	12.3
	15	45 02.4 ••	12.4
	16	60 02.3	12.6
	17	75 02.2	12.7
	18	90 02.1	+23 12.8
	19	105 01.9	13.0
	20	120 01.8	13.1
	21	135 01.7 ••	13.3
	22	150 01.5	13.4
	23	165 01.4	13.5
14	0	180 01.3	+23 13.7
	1	195 01.2	13.8
	2	210 01.0	14.0
	3	225 00.9 ••	14.1
	4	240 00.8	14.2
	5	255 00.6	14.4
	6	270 00.5	+23 14.5
	7	285 00.4	14.6
	8	300 00.2	14.7
	9	315 00.1 ••	14.9
	10	330 00.0	15.0
	11	344 59.9	15.1
	12	359 59.7	+23 15.3
	13	14 59.6	15.4
	14	29 59.5	15.5
	15	44 59.3 ••	15.6
	16	59 59.2	15.8
	17	74 59.1	15.9
	18	89 58.9	+23 16.0
	19	104 58.8	16.1
	20	119 58.7	16.3
	21	134 58.5 ••	16.4
	22	149 58.4	16.5
	23	164 58.3	16.6
	24	179 58.2	+23 16.8
code		–	+ 1

No.	STARS Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 52.1	−40 29.0
5	Achernar	335 59.8	−57 27.7
30	Acrux	173 58.8	−62 51.2
19	Adhara	255 47.7	−28 54.6
10	Aldebaran	291 40.5	+16 25.2
32	Alioth	166 59.1	+56 12.6
34	Alkaid	153 33.3	+49 32.5
55	Al Na'ir	28 38.9	−47 10.7
15	Alnilam	276 31.6	− 1 13.7
25	Alphard	218 39.7	− 8 27.7
41	Alphecca	126 48.1	+26 52.0
1	Alpheratz	358 29.4	+28 50.3
51	Altair	62 51.1	+ 8 44.8
2	Ankaa	353 59.3	−42 32.9
42	Antares	113 20.2	−26 20.1
37	Arcturus	146 35.8	+19 25.1
43	Atria	109 01.3	−68 57.0
22	Avior	234 36.7	−59 22.0
13	Bellatrix	279 19.8	+ 6 18.6
16	Betelg'se	271 49.5	+ 7 24.0
17	Canopus	264 16.3	−52 40.2
12	Capella	281 40.3	+45 57.3
53	Deneb	50 01.4	+45 06.9
28	Denebola	183 18.7	+14 49.6
4	Diphda	349 40.3	−18 14.0
27	Dubhe	194 45.7	+62 00.0
14	Elnath	279 08.9	+28 34.3
47	Eltanin	91 06.1	+51 29.5
54	Enif	34 30.4	+ 9 39.9
56	Fomalhaut	16 12.6	−29 51.6
31	Gacrux	172 50.3	−56 51.9
29	Gienah	176 37.8	−17 17.6
35	Hadar	149 50.5	−60 09.6
6	Hamal	328 51.0	+23 14.9
48	Kaus Aust.	84 42.0	−34 24.5
40	Kochab	137 16.7	+74 20.6
57	Markab	14 22.4	+14 57.6
8	Menkar	315 01.6	+ 3 54.8
36	Menkent	148 59.6	−36 09.1
24	Miapl'dus	221 49.9	−69 32.1
9	Mirfak	309 44.2	+49 42.0
50	Nunki	76 52.7	−26 21.3
52	Peacock	54 28.3	−56 52.8
21	Pollux	244 22.1	+28 08.3
20	Procyon	245 46.3	+ 5 20.6
46	R'alhague	96 47.2	+12 35.4
26	Regulus	208 30.7	+12 11.4
11	Rigel	281 54.9	− 8 15.1
38	Rigil Kent.	140 51.9	−60 39.3
44	Sabik	103 02.9	−15 40.3
3	Schedar	350 31.3	+56 17.1
45	Shaula	97 21.6	−37 04.4
18	Sirius	259 13.0	−16 39.2
33	Spica	159 17.8	−10 55.6
23	Suhail	223 25.4	−43 15.1
49	Vega	81 08.5	+38 44.3
39	Zub'g'bi	137 54.2	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 12	13	14	15
N °	h m	h m	h m	h m	h m	h m
72	□	□	■	■	■	■
70	□	□	20 07	■	■	■
68	□	□	19 01	■	■	■
66	□	□	18 26	20 21	■	■
64	1 35	////	18 01	19 38	21 15	22 37
62	2 12	////	17 41	19 09	20 33	21 42
60	2 37	////	17 25	18 47	20 04	21 09
58	2 57	////	17 11	18 29	19 42	20 45
56	3 14	////	17 00	18 14	19 24	20 26
54	3 28	////	16 50	18 01	19 09	20 09
52	3 40	////	16 41	17 50	18 56	19 55
50	3 50	////	16 33	17 40	18 44	19 43
45	4 13	1 42	16 16	17 19	18 20	19 18
40	4 30	2 29	16 02	17 02	18 01	18 58
35	4 45	2 59	15 50	16 48	17 45	18 41
30	4 58	3 22	15 40	16 36	17 31	18 26
20	5 20	3 56	15 23	16 15	17 08	18 02
10	5 39	4 22	15 07	15 57	16 48	17 41
0	5 56	4 41	14 53	15 40	16 29	17 21
10	6 14	4 58	14 39	15 23	16 10	17 01
20	6 32	5 14	14 24	15 05	15 51	16 40
30	6 53	5 27	14 08	14 45	15 27	16 16
35	7 05	5 35	13 58	14 33	15 14	16 01
40	7 19	5 42	13 46	14 19	14 59	15 45
45	7 36	5 48	13 33	14 03	14 40	15 25
50	7 56	5 57	13 17	13 44	14 17	15 00
52	8 06	6 00	13 10	13 34	14 06	14 48
54	8 17	6 03	13 02	13 24	13 54	14 35
56	8 29	6 08	12 53	13 12	13 40	14 19
58	8 44	6 11	12 42	12 59	13 23	14 00
60	9 01	6 15	12 30	12 43	13 03	13 37
S						

Lat.	Sunset	Twlt. ends	Moonset 12	13	14	15
N °	h m	h m	h m	h m	h m	h m
72	□	□	■	■	■	■
70	□	□	21 47	■	■	■
68	□	□	22 54	■	■	■
66	□	□	23 31	23 13	■	■
64	22 25	////	23 57	23 57	24 03	0 03
62	21 49	////	0 12	0 17	0 26	0 46
60	21 23	////	0 24	0 34	0 49	1 15
58	21 03	////	0 34	0 48	1 07	1 37
56	20 47	////	0 43	1 00	1 23	1 55
54	20 33	////	0 51	1 10	1 36	2 11
52	20 20	////	0 58	1 20	1 48	2 24
50	20 10	////	1 05	1 28	1 58	2 36
45	19 47	22 19	1 19	1 46	2 20	3 00
40	19 29	21 32	1 31	2 01	2 37	3 19
35	19 15	21 02	1 41	2 14	2 52	3 36
30	19 02	20 38	1 49	2 25	3 05	3 50
20	18 40	20 04	2 04	2 44	3 26	4 14
10	18 21	19 38	2 18	3 00	3 46	4 35
0	18 04	19 19	2 30	3 15	4 03	4 54
10	17 47	19 02	2 43	3 31	4 21	5 13
20	17 28	18 47	2 56	3 48	4 40	5 34
30	17 07	18 32	3 11	4 07	5 03	5 58
35	16 55	18 26	3 21	4 18	5 16	6 12
40	16 41	18 18	3 31	4 31	5 31	6 29
45	16 24	18 11	3 43	4 46	5 49	6 48
50	16 04	18 03	3 58	5 05	6 11	7 13
52	15 54	18 00	4 04	5 14	6 22	7 25
54	15 43	17 56	4 12	5 24	6 34	7 38
56	15 30	17 52	4 21	5 35	6 48	7 54
58	15 16	17 48	4 31	5 48	7 04	8 13
60	14 59	17 44	4 42	6 04	7 24	8 36
S						

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
30	0.1	0.1	0.3
45	0.1	0.1	0.3
60	0.1	0.1	0.2
75	0.1	0.0	0.1
90	0.1	0.0	0.0

Moon's Lower Limb **Add**

Alt.	12	13	14
°	′	′	′
0	12.0	12.2	12.5
4	12.0	12.3	12.5
8	12.0	12.3	12.5
12	12.1	12.3	12.6
16	12.1	12.4	12.6
20	12.2	12.4	12.7
24	12.3	12.5	12.7
28	12.4	12.6	12.8
32	12.5	12.7	12.9
36	12.6	12.8	13.0
40	12.7	12.9	13.1
44	12.8	13.0	13.2
48	13.0	13.2	13.4
52	13.1	13.3	13.5
56	13.3	13.5	13.6
60	13.5	13.6	13.8
64	13.6	13.8	13.9
68	13.8	14.0	14.1
72	14.0	14.1	14.2
76	14.2	14.3	14.4
80	14.4	14.5	14.6
84	14.6	14.7	14.7
88	14.7	14.8	14.9
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	12	13	14
°	′	′	′
0	17.6	17.4	17.3
4	17.6	17.4	17.3
8	17.5	17.4	17.3
12	17.5	17.4	17.2
16	17.5	17.3	17.2
20	17.4	17.3	17.1
24	17.3	17.2	17.1
28	17.2	17.1	17.0
32	17.1	17.0	16.9
36	17.0	16.9	16.8
40	16.9	16.8	16.7
44	16.7	16.6	16.6
48	16.6	16.5	16.4
52	16.4	16.4	16.3
56	16.3	16.2	16.2
60	16.1	16.1	16.0
64	15.9	15.9	15.9
68	15.7	15.7	15.7
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.2	15.2	15.2
84	15.0	15.0	15.1
88	14.8	14.9	14.9
90			

Subtract from table, back cover

GMT	Equation of Time (App.—Mean) 12	13	14
h	m s	m s	m s
0	+ 0 30.0	+ 0 17.8	+ 0 05.4
6	+ 0 26.9	+ 0 14.7	+ 0 02.3
12	+ 0 23.9	+ 0 11.6	− 0 00.9
18	+ 0 20.8	+ 0 08.5	− 0 04.0
24	+ 0 17.8	+ 0 05.4	− 0 07.1

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
12	21 04	14 23	1 08	12 57	20 45
13	21 52	14 24	1 03	12 54	20 41
14	22 42	14 25	0 58	12 51	20 36
15	23 34	14 27	0 53	12 48	20 32

Trinity Sunday 13

GMT	♈ GHA	VENUS −3.4 GHA	VENUS Dec.	MARS −2.1 GHA	MARS Dec.	JUPITER −1.4 GHA	JUPITER Dec.	SATURN 0.6 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
15 0	262 44.5	143 31.9	+22 38.9	346 38.4	−27 00.3	167 30.1	+23 18.1	51 02.2	−10 05.2	18 57.7	100	−24 34.7	−32
1	277 47.0	158 31.2	38.3	1 41.6	00.5	182 31.9	18.1	66 04.7	05.2	33 26.7	101	24 37.9	−30
2	292 49.5	173 30.5	37.8	16 44.7	00.7	197 33.8	18.1	81 07.3	05.2	47 55.8	99	24 40.9	−29
3	307 51.9	188 29.8	•• 37.2	31 47.9	•• 00.9	212 35.6	•• 18.1	96 09.8	•• 05.2	62 24.7	100	·24 43.8	−28
4	322 54.4	203 29.1	36.7	46 51.1	01.1	227 37.5	18.0	111 12.3	05.1	76 53.7	99	24 46.6	−27
5	337 56.9	218 28.4	36.1	61 54.3	01.3	242 39.3	18.0	126 14.9	05.1	91 22.6	98	24 49.3	−25
6	352 59.3	233 27.7	+22 35.5	76 57.5	−27 01.4	257 41.2	+23 18.0	141 17.4	−10 05.1	105 51.4	98	−24 51.8	−24
7	8 01.8	248 27.0	35.0	92 00.7	01.6	272 43.0	18.0	156 20.0	05.1	120 20.2	98	24 54.2	−23
8	23 04.2	263 26.4	34.4	107 03.8	01.8	287 44.9	18.0	171 22.5	05.1	134 49.0	97	24 56.5	−22
9	38 06.7	278 25.7	•• 33.8	122 07.0	•• 02.0	302 46.7	•• 18.0	186 25.1	•• 05.0	149 17.7	96	·24 58.7	−20
10	53 09.2	293 25.0	33.3	137 10.2	02.2	317 48.6	17.9	201 27.6	05.0	163 46.3	97	25 00.7	−20
11	68 11.6	308 24.3	32.7	152 13.4	02.4	332 50.5	17.9	216 30.2	05.0	178 15.0	96	25 02.7	−17
12	83 14.1	323 23.6	+22 32.1	167 16.6	−27 02.6	347 52.3	+23 17.9	231 32.7	−10 05.0	192 43.6	95	−25 04.4	−17
13	98 16.6	338 22.9	31.6	182 19.8	02.8	2 54.2	17.9	246 35.3	05.0	207 12.1	96	25 06.1	−15
14	113 19.0	353 22.2	31.0	197 23.0	03.0	17 56.0	17.9	261 37.8	04.9	221 40.7	94	25 07.6	−15
15	128 21.5	8 21.5	•• 30.4	212 26.2	•• 03.2	32 57.9	•• 17.9	276 40.4	•• 04.9	236 09.1	95	·25 09.1	−12
16	143 24.0	23 20.9	29.9	227 29.4	03.4	47 59.7	17.8	291 42.9	04.9	250 37.6	94	25 10.3	−12
17	158 26.4	38 20.2	29.3	242 32.6	03.5	63 01.6	17.8	306 45.5	04.9	265 06.0	94	25 11.5	−10
18	173 28.9	53 19.5	+22 28.7	257 35.7	−27 03.7	78 03.4	+23 17.8	321 48.0	−10 04.9	279 34.4	93	−25 12.5	−9
19	188 31.4	68 18.8	28.1	272 38.9	03.9	93 05.3	17.8	336 50.6	04.8	294 02.7	94	25 13.4	−7
20	203 33.8	83 18.1	27.6	287 42.1	04.1	108 07.1	17.8	351 53.1	04.8	308 31.1	93	25 14.1	−7
21	218 36.3	98 17.4	•• 27.0	302 45.3	•• 04.3	123 09.0	•• 17.8	6 55.7	•• 04.8	322 59.4	92	·25 14.8	−5
22	233 38.7	113 16.8	26.4	317 48.5	04.5	138 10.8	17.7	21 58.2	04.8	337 27.6	93	25 15.3	−3
23	248 41.2	128 16.1	25.8	332 51.7	04.7	153 12.7	17.7	37 00.8	04.8	351 55.9	92	25 15.6	−3
16 0	263 43.7	143 15.4	+22 25.2	347 54.9	−27 04.9	168 14.5	+23 17.7	52 03.3	−10 04.8	6 24.1	92	−25 15.9	−1
1	278 46.1	158 14.7	24.6	2 58.1	05.1	183 16.4	17.7	67 05.8	04.7	20 52.3	91	25 16.0	+1
2	293 48.6	173 14.0	24.1	18 01.3	05.2	198 18.2	17.7	82 08.4	04.7	35 20.4	92	25 15.9	+1
3	308 51.1	188 13.4	•• 23.5	33 04.5	•• 05.4	213 20.1	•• 17.7	97 10.9	•• 04.7	49 48.6	91	·25 15.8	+3
4	323 53.5	203 12.7	22.9	48 07.7	05.6	228 21.9	17.6	112 13.5	04.7	64 16.7	91	25 15.5	+4
5	338 56.0	218 12.0	22.3	63 11.0	05.8	243 23.8	17.6	127 16.0	04.7	78 44.8	91	25 15.1	+6
6	353 58.5	233 11.3	+22 21.7	78 14.2	−27 06.0	258 25.6	+23 17.6	142 18.6	−10 04.6	93 12.9	91	−25 14.5	+7
7	9 00.9	248 10.7	21.1	93 17.4	06.2	273 27.5	17.6	157 21.1	04.6	107 41.0	90	25 13.8	+8
8	24 03.4	263 10.0	20.5	108 20.6	06.4	288 29.3	17.6	172 23.7	04.6	122 09.0	90	25 13.0	+10
9	39 05.9	278 09.3	•• 19.9	123 23.8	•• 06.6	303 31.2	•• 17.5	187 26.2	•• 04.6	136 37.0	91	·25 12.0	+11
10	54 08.3	293 08.6	19.4	138 27.0	06.8	318 33.0	17.5	202 28.7	04.6	151 05.1	90	25 10.9	+12
11	69 10.8	308 08.0	18.8	153 30.2	06.9	333 34.9	17.5	217 31.3	04.6	165 33.1	90	25 09.7	+14
12	84 13.2	323 07.3	+22 18.2	168 33.4	−27 07.1	348 36.7	+23 17.5	232 33.8	−10 04.5	180 01.1	90	−25 08.3	+15
13	99 15.7	338 06.6	17.6	183 36.6	07.3	3 38.6	17.5	247 36.4	04.5	194 29.1	90	25 06.8	+16
14	114 18.2	353 05.9	17.0	198 39.8	07.5	18 40.4	17.5	262 38.9	04.5	208 57.1	89	25 05.2	+18
15	129 20.6	8 05.3	•• 16.4	213 43.1	•• 07.7	33 42.3	•• 17.4	277 41.5	•• 04.5	223 25.0	90	·25 03.4	+19
16	144 23.1	23 04.6	15.8	228 46.3	07.9	48 44.1	17.4	292 44.0	04.5	237 53.0	89	25 01.5	+20
17	159 25.6	38 03.9	15.2	243 49.5	08.1	63 46.0	17.4	307 46.6	04.4	252 20.9	90	24 59.5	+22
18	174 28.0	53 03.3	+22 14.6	258 52.7	−27 08.3	78 47.8	+23 17.4	322 49.1	−10 04.4	266 48.9	90	−24 57.3	+23
19	189 30.5	68 02.6	14.0	273 55.9	08.4	93 49.7	17.4	337 51.6	04.4	281 16.9	89	24 55.0	+24
20	204 33.0	83 01.9	13.4	288 59.1	08.6	108 51.5	17.3	352 54.2	04.4	295 44.8	90	24 52.6	+26
21	219 35.4	98 01.3	•• 12.8	304 02.4	•• 08.8	123 53.4	•• 17.3	7 56.7	•• 04.4	310 12.8	89	·24 50.0	+27
22	234 37.9	113 00.6	12.2	319 05.6	09.0	138 55.2	17.3	22 59.3	04.4	324 40.7	90	24 47.3	+28
23	249 40.4	127 59.9	11.6	334 08.8	09.2	153 57.1	17.3	38 01.8	04.3	339 08.7	89	24 44.5	+30
17 0	264 42.8	142 59.3	+22 11.0	349 12.0	−27 09.4	168 58.9	+23 17.3	53 04.4	−10 04.3	353 36.6	90	−24 41.5	+31
1	279 45.3	157 58.6	10.3	4 15.2	09.6	184 00.8	17.3	68 06.9	04.3	8 04.6	90	24 38.4	+32
2	294 47.7	172 57.9	09.7	19 18.5	09.7	199 02.6	17.2	83 09.4	04.3	22 32.6	89	24 35.2	+34
3	309 50.2	187 57.3	•• 09.1	34 21.7	•• 09.9	214 04.5	•• 17.2	98 12.0	•• 04.3	37 00.5	90	·24 31.8	+35
4	324 52.7	202 56.6	08.5	49 24.9	10.1	229 06.3	17.2	113 14.5	04.3	51 28.5	90	24 28.3	+36
5	339 55.1	217 55.9	07.9	64 28.1	10.3	244 08.2	17.2	128 17.1	04.2	65 56.5	90	24 24.7	+38
6	354 57.6	232 55.3	+22 07.3	79 31.4	−27 10.5	259 10.0	+23 17.2	143 19.6	−10 04.2	80 24.5	90	−24 20.9	+39
7	10 00.1	247 54.6	06.7	94 34.6	10.7	274 11.9	17.1	158 22.2	04.2	94 52.5	90	24 17.0	+40
8	25 02.5	262 54.0	06.1	109 37.8	10.9	289 13.7	17.1	173 24.7	04.2	109 20.5	91	24 13.0	+42
9	40 05.0	277 53.3	•• 05.4	124 41.1	•• 11.0	304 15.6	•• 17.1	188 27.2	•• 04.2	123 48.6	90	·24 08.8	+43
10	55 07.5	292 52.6	04.8	139 44.3	11.2	319 17.4	17.1	203 29.8	04.2	138 16.6	91	24 04.5	+44
11	70 09.9	307 52.0	04.2	154 47.5	11.4	334 19.3	17.1	218 32.3	04.1	152 44.7	91	24 00.1	+46
12	85 12.4	322 51.3	+22 03.6	169 50.8	−27 11.6	349 21.1	+23 17.1	233 34.9	−10 04.1	167 12.8	91	−23 55.5	+47
13	100 14.8	337 50.7	03.0	184 54.0	11.8	4 23.0	17.0	248 37.4	04.1	181 40.9	91	23 50.8	+48
14	115 17.3	352 50.0	02.4	199 57.2	12.0	19 24.8	17.0	263 39.9	04.1	196 09.0	91	23 46.0	+50
15	130 19.8	7 49.3	•• 01.7	215 00.5	•• 12.2	34 26.7	•• 17.0	278 42.5	•• 04.1	210 37.1	92	·23 41.0	+50
16	145 22.2	22 48.7	01.1	230 03.7	12.3	49 28.5	17.0	293 45.0	04.1	225 05.3	92	23 36.0	+53
17	160 24.7	37 48.0	22 00.5	245 06.9	12.5	64 30.4	17.0	308 47.6	04.0	239 33.5	92	23 30.7	+53
18	175 27.2	52 47.4	+21 59.9	260 10.2	−27 12.7	79 32.2	+23 16.9	323 50.1	−10 04.0	254 01.7	92	−23 25.4	+55
19	190 29.6	67 46.7	59.2	275 13.4	12.9	94 34.1	16.9	338 52.6	04.0	268 29.9	92	23 19.9	+56
20	205 32.1	82 46.1	58.6	290 16.6	13.1	109 35.9	16.9	353 55.2	04.0	282 58.1	93	23 14.3	+57
21	220 34.6	97 45.4	•• 58.0	305 19.9	•• 13.3	124 37.8	•• 16.9	8 57.7	•• 04.0	297 26.4	93	·23 08.6	+58
22	235 37.0	112 44.8	57.3	320 23.1	13.4	139 39.6	16.9	24 00.3	04.0	311 54.7	93	23 02.8	+60
23	250 39.5	127 44.1	56.7	335 26.4	13.6	154 41.5	16.8	39 02.8	03.9	326 23.0	94	22 56.8	+61
24	265 42.0	142 43.4	+21 56.1	350 29.6	−27 13.8	169 43.3	+23 16.8	54 05.3	−10 03.9	340 51.4	94	−22 50.7	+63
code	—	−7	−6	+32	−2	+19	0	+26	0				

G.M.T.	SUN GHA	SUN Dec.
h	° ′	° ′
15 0	179 58.2	+23 16.8
1	194 58.0	16.9
2	209 57.9	17.0
3	224 57.8	•• 17.1
4	239 57.6	17.2
5	254 57.5	17.3
6	269 57.4	+23 17.5
7	284 57.2	17.6
8	299 57.1	17.7
9	314 57.0	•• 17.8
10	329 56.8	17.9
11	344 56.7	18.0
12	359 56.6	+23 18.1
13	14 56.4	18.2
14	29 56.3	18.4
15	44 56.2	•• 18.5
16	59 56.0	18.6
17	74 55.9	18.7
18	89 55.8	+23 18.8
19	104 55.6	18.9
20	119 55.5	19.0
21	134 55.4	•• 19.1
22	149 55.3	19.2
23	164 55.1	19.3
16 0	179 55.0	+23 19.4
1	194 54.9	19.5
2	209 54.7	19.6
3	224 54.6	•• 19.7
4	239 54.5	19.8
5	254 54.3	19.9
6	269 54.2	+23 20.0
7	284 54.1	20.1
8	299 53.9	20.2
9	314 53.8	•• 20.3
10	329 53.7	20.4
11	344 53.5	20.5
12	359 53.4	+23 20.6
13	14 53.3	20.7
14	29 53.1	20.8
15	44 53.0	•• 20.9
16	59 52.9	21.0
17	74 52.7	21.1
18	89 52.6	+23 21.1
19	104 52.5	21.2
20	119 52.3	21.3
21	134 52.2	•• 21.4
22	149 52.1	21.5
23	164 51.9	21.6
17 0	179 51.8	+23 21.7
1	194 51.7	21.8
2	209 51.5	21.8
3	224 51.4	•• 21.9
4	239 51.3	22.0
5	254 51.1	22.1
6	269 51.0	+23 22.2
7	284 50.9	22.3
8	299 50.7	22.3
9	314 50.6	•• 22.4
10	329 50.5	22.5
11	344 50.3	22.6
12	359 50.2	+23 22.6
13	14 50.1	22.7
14	29 49.9	22.8
15	44 49.8	•• 22.9
16	59 49.7	22.9
17	74 49.5	23.0
18	89 49.4	+23 23.1
19	104 49.3	23.2
20	119 49.1	23.2
21	134 49.0	•• 23.3
22	149 48.9	23.4
23	164 48.7	23.4
24	179 48.6	+23 23.5
code	−	+ 1

STARS

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 52.1	−40 28.9
5	Achernar	335 59.8	−57 27.7
30	Acrux	173 58.9	−62 51.2
19	Adhara	255 47.7	−28 54.6
10	Aldebaran	291 40.5	+16 25.2
32	Alioth	166 59.1	+56 12.6
34	Alkaid	153 33.3	+49 32.5
55	Al Na'ir	28 38.9	−47 10.7
15	Alnilam	276 31.6	− 1 13.7
25	Alphard	218 39.7	− 8 27.7
41	Alphecca	126 48.1	+26 52.0
1	Alpheratz	358 29.4	+28 50.3
51	Altair	62 51.1	+ 8 44.8
2	Ankaa	353 59.3	−42 32.9
42	Antares	113 20.2	−26 20.1
37	Arcturus	146 35.8	+19 25.1
43	Atria	109 01.3	−68 57.0
22	Avior	234 36.7	−59 22.0
13	Bellatrix	279 19.8	+ 6 18.6
16	Betelg'se	271 49.5	+ 7 24.0
17	Canopus	264 16.3	−52 40.2
12	Capella	281 40.3	+45 57.3
53	Deneb	50 01.3	+45 06.9
28	Denebola	183 18.7	+14 49.6
4	Diphda	349 40.3	−18 14.0
27	Dubhe	194 45.8	+62 00.0
14	Elnath	279 08.9	+28 34.3
47	Eltanin	91 06.1	+51 29.6
54	Enif	34 30.4	+ 9 39.9
56	Fomalhaut	16 12.6	−29 51.6
31	Gacrux	172 50.3	−56 51.9
29	Gienah	176 37.8	−17 17.6
35	Hadar	149 50.5	−60 09.6
6	Hamal	328 51.0	+23 14.9
48	Kaus Aust.	84 42.0	−34 24.5
40	Kochab	137 16.8	+74 20.6
57	Markab	14 22.4	+14 57.6
8	Menkar	315 01.6	+ 3 54.8
36	Menkent	148 59.6	−36 09.1
24	Miapl'dus	221 50.0	−69 32.1
9	Mirfak	309 44.2	+49 42.0
50	Nunki	76 52.7	−26 21.3
52	Peacock	54 28.3	−56 52.8
21	Pollux	244 22.1	+28 08.3
20	Procyon	245 46.3	+ 5 20.6
46	R'alhague	96 47.1	+12 35.5
26	Regulus	208 30.7	+12 11.4
11	Rigel	281 54.9	− 8 15.1
38	Rigil Kent.	140 51.9	−60 39.3
44	Sabik	103 02.9	−15 40.3
3	Schedar	350 31.3	+56 17.1
45	Shaula	97 21.6	−37 04.4
18	Sirius	259 13.0	−16 39.1
33	Spica	159 17.8	−10 55.6
23	Suhail	223 25.4	−43 15.1
49	Vega	81 08.5	+38 44.3
39	Zub'g'bi	137 54.2	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 15	Moonrise 16	Moonrise 17	Moonrise 18
N °	h m	h m	h m	h m	h m	h m
72	□	□	■	■	■	■
70	□	□	■	■	■	■
68	□	□	■	■	■	■
66	□	□	■	■	■	0 05 / 23 45
64	1 32	////	22 37	23 10	23 18	23 19
62	2 10	////	21 42	22 25	22 47	22 58
60	2 36	////	21 09	21 55	22 24	22 41
58	2 56	////	20 45	21 33	22 05	22 27
56	3 13	////	20 26	21 14	21 50	22 15
54	3 27	////	20 09	20 59	21 36	22 05
52	3 39	////	19 55	20 45	21 25	21 55
50	3 50	////	19 43	20 33	21 14	21 47
45	4 13	1 40	19 18	20 09	20 52	21 28
40	4 30	2 27	18 58	19 49	20 34	21 14
35	4 45	2 58	18 41	19 33	20 19	21 01
30	4 58	3 22	18 26	19 18	20 06	20 50
20	5 20	3 56	18 02	18 54	19 44	20 31
10	5 39	4 21	17 41	18 33	19 25	20 14
0	5 57	4 42	17 21	18 14	19 07	19 59
10	6 14	4 59	17 01	17 54	18 49	19 43
20	6 33	5 14	16 40	17 33	18 29	19 26
30	6 54	5 29	16 16	17 09	18 07	19 07
35	7 06	5 35	16 01	16 55	17 54	18 56
40	7 20	5 42	15 45	16 38	17 39	18 43
45	7 37	5 50	15 25	16 19	17 20	18 28
50	7 58	5 58	15 00	15 54	16 58	18 09
52	8 08	6 01	14 48	15 42	16 47	18 00
54	8 19	6 05	14 35	15 28	16 35	17 50
56	8 31	6 09	14 19	15 13	16 20	17 38
58	8 46	6 12	14 00	14 54	16 04	17 25
60 S	9 03	6 17	13 37	14 30	15 44	17 09

Lat.	Sunset	Twlt. ends	Moonset 15	Moonset 16	Moonset 17	Moonset 18
N °	h m	h m	h m	h m	h m	h m
72	□	□	■	■	■	■
70	□	□	■	■	■	■
68	□	□	■	■	■	■
66	□	□	■	■	■	2 43
64	22 29	////	0 03	0 30	1 47	3 30
62	21 52	////	0 46	1 25	2 32	4 00
60	21 26	////	1 15	1 58	3 02	4 22
58	21 05	////	1 37	2 22	3 24	4 41
56	20 48	////	1 55	2 41	3 42	4 56
54	20 34	////	2 11	2 58	3 58	5 09
52	20 22	////	2 24	3 12	4 11	5 20
50	20 11	////	2 36	3 24	4 23	5 31
45	19 49	22 22	3 00	3 49	4 47	5 52
40	19 31	21 34	3 19	4 09	5 06	6 09
35	19 16	21 03	3 36	4 26	5 22	6 23
30	19 03	20 40	3 50	4 41	5 36	6 36
20	18 41	20 05	4 14	5 05	6 00	6 57
10	18 22	19 40	4 35	5 26	6 20	7 15
0	18 04	19 19	4 54	5 46	6 39	7 32
10	17 47	19 02	5 13	6 06	6 58	7 49
20	17 28	18 47	5 34	6 27	7 18	8 07
30	17 07	18 32	5 58	6 52	7 42	8 27
35	16 55	18 26	6 12	7 06	7 55	8 39
40	16 41	18 19	6 29	7 23	8 11	8 53
45	16 24	18 11	6 48	7 42	8 30	9 09
50	16 03	18 02	7 13	8 07	8 53	9 29
52	15 54	18 00	7 25	8 19	9 04	9 39
54	15 42	17 55	7 38	8 33	9 17	9 49
56	15 30	17 52	7 54	8 49	9 31	10 01
58	15 15	17 48	8 13	9 08	9 48	10 15
60 S	14 58	17 44	8 36	9 31	10 08	10 31

Equation of Time (App.—Mean)

GMT	15	16	17
h	m s	m s	m s
0	− 0 07.1	− 0 19.8	− 0 32.6
6	− 0 10.3	− 0 23.0	− 0 35.8
12	− 0 13.5	− 0 26.2	− 0 39.0
18	− 0 16.6	− 0 29.4	− 0 42.2
24	− 0 19.8	− 0 32.6	− 0 45.4

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
15	23 34	14 27	0 53	12 48	20 32
16	24 27	14 28	0 48	12 46	20 28
17	0 27	14 29	0 43	12 43	20 24
18	1 19	14 30	0 38	12 40	20 20

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.1	0.1	0.3
30	0.1	0.1	0.3
45	0.1	0.1	0.2
60	0.1	0.0	0.1
75	0.1	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	15	16	17
°	′	′	′
0	13.0	13.5	14.2
4	13.0	13.5	14.2
8	13.0	13.5	14.2
12	13.1	13.6	14.2
16	13.1	13.6	14.2
20	13.2	13.6	14.2
24	13.2	13.7	14.3
28	13.3	13.7	14.3
32	13.3	13.8	14.3
36	13.4	13.9	14.4
40	13.5	13.9	14.4
44	13.6	14.0	14.5
48	13.7	14.1	14.5
52	13.8	14.2	14.6
56	13.9	14.3	14.7
60	14.1	14.4	14.7
64	14.2	14.5	14.8
68	14.3	14.6	14.9
72	14.5	14.7	14.9
76	14.6	14.8	15.0
80	14.7	14.9	15.1
84	14.9	15.0	15.2
88	15.0	15.1	15.2
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	15	16	17
°	′	′	′
0	17.0	16.7	16.4
4	17.0	16.7	16.3
8	17.0	16.7	16.3
12	16.9	16.7	16.3
16	16.9	16.6	16.3
20	16.9	16.6	16.3
24	16.8	16.6	16.2
28	16.7	16.5	16.2
32	16.7	16.4	16.2
36	16.6	16.4	16.1
40	16.5	16.3	16.1
44	16.4	16.2	16.0
48	16.3	16.1	16.0
52	16.2	16.1	15.9
56	16.1	16.0	15.8
60	15.9	15.9	15.8
64	15.8	15.8	15.7
68	15.7	15.7	15.6
72	15.6	15.6	15.6
76	15.4	15.4	15.5
80	15.3	15.3	15.4
84	15.1	15.2	15.3
88	15.0	15.1	15.3
90			

Subtract from table, back cover

Full Moon 16
Corpus Christi 17

GMT	h	♈ GHA	VENUS −3.4 GHA	VENUS Dec	MARS −2.2 GHA	MARS Dec.	JUPITER −1.4 GHA	JUPITER Dec.	SATURN 0.7 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
18	0	265 42.0	142 43.4	+21 56.1	350 29.6	−27 13.8	169 43.3	+23 16.8	54 05.3	−10 03.9	340 51.4	94	−22 50.7	+63
	1	280 44.4	157 42.8	55.5	5 32.9	14.0	184 45.2	16.8	69 07.9	03.9	355 19.8	94	22 44.4	+63
	2	295 46.9	172 42.1	54.8	20 36.1	14.2	199 47.0	16.8	84 10.4	03.9	9 48.2	94	22 38.1	+65
	3	310 49.3	187 41.5	·· 54.2	35 39.3	·· 14.4	214 48.9	·· 16.8	99 12.9	·· 03.9	24 16.6	95	·22 31.6	+66
	4	325 51.8	202 40.8	53.6	50 42.6	14.5	229 50.7	16.7	114 15.5	03.9	38 45.1	95	22 25.0	+67
	5	340 54.3	217 40.2	52.9	65 45.8	14.7	244 52.6	16.7	129 18.0	03.9	53 13.6	95	22 18.3	+69
	6	355 56.7	232 39.5	+21 52.3	80 49.1	−27 14.9	259 54.4	+23 16.7	144 20.6	−10 03.8	67 42.1	96	−22 11.4	+69
	7	10 59.2	247 38.9	51.6	95 52.3	15.1	274 56.3	16.7	159 23.1	03.8	82 10.7	96	22 04.5	+71
	8	26 01.7	262 38.3	51.0	110 55.6	15.3	289 58.1	16.7	174 25.6	03.8	96 39.3	96	21 57.4	+72
	9	41 04.1	277 37.6	·· 50.4	125 58.8	·· 15.4	305 00.0	·· 16.6	189 28.2	·· 03.8	111 07.9	97	·21 50.2	+74
	10	56 06.6	292 37.0	49.7	141 02.1	15.6	320 01.8	16.6	204 30.7	03.8	125 36.6	97	21 42.8	+74
	11	71 09.1	307 36.3	49.1	156 05.3	15.8	335 03.7	16.6	219 33.3	03.8	140 05.3	97	21 35.4	+76
	12	86 11.5	322 35.7	+21 48.4	171 08.6	−27 16.0	350 05.5	+23 16.6	234 35.8	−10 03.7	154 34.0	98	−21 27.8	+77
	13	101 14.0	337 35.0	47.8	186 11.8	16.2	5 07.4	16.6	249 38.3	03.7	169 02.8	98	21 20.1	+78
	14	116 16.5	352 34.4	47.1	201 15.1	16.3	20 09.2	16.5	264 40.9	03.7	183 31.6	98	21 12.3	+79
	15	131 18.9	7 33.7	·· 46.5	216 18.3	·· 16.5	35 11.1	·· 16.5	279 43.4	·· 03.7	198 00.4	99	·21 04.4	+80
	16	146 21.4	22 33.1	45.8	231 21.6	16.7	50 12.9	16.5	294 45.9	03.7	212 29.3	99	20 56.4	+82
	17	161 23.8	37 32.5	45.2	246 24.8	16.9	65 14.8	16.5	309 48.5	03.7	226 58.2	100	20 48.2	+82
	18	176 26.3	52 31.8	+21 44.6	261 28.1	−27 17.1	80 16.6	+23 16.5	324 51.0	−10 03.7	241 27.2	100	−20 40.0	+84
	19	191 28.8	67 31.2	43.9	276 31.4	17.2	95 18.5	16.4	339 53.5	03.6	255 56.2	100	20 31.6	+85
	20	206 31.2	82 30.5	43.2	291 34.6	17.4	110 20.3	16.4	354 56.1	03.6	270 25.2	101	20 23.1	+86
	21	221 33.7	97 29.9	·· 42.6	306 37.9	·· 17.6	125 22.2	·· 16.4	9 58.6	·· 03.6	284 54.3	101	·20 14.5	+87
	22	236 36.2	112 29.3	41.9	321 41.1	17.8	140 24.0	16.4	25 01.2	03.6	299 23.4	102	20 05.8	+89
	23	251 38.6	127 28.6	41.3	336 44.4	18.0	155 25.9	16.4	40 03.7	03.6	313 52.6	102	19 56.9	+89
19	0	266 41.1	142 28.0	+21 40.6	351 47.7	−27 18.1	170 27.7	+23 16.3	55 06.2	−10 03.6	328 21.8	102	−19 48.0	+90
	1	281 43.6	157 27.3	40.0	6 50.9	18.3	185 29.6	16.3	70 08.8	03.6	342 51.0	103	19 39.0	+92
	2	296 46.0	172 26.7	39.3	21 54.2	18.5	200 31.4	16.3	85 11.3	03.5	357 20.3	103	19 29.8	+92
	3	311 48.5	187 26.1	·· 38.7	36 57.4	·· 18.7	215 33.3	·· 16.3	100 13.8	·· 03.5	11 49.6	103	·19 20.6	+94
	4	326 51.0	202 25.4	38.0	52 00.7	18.9	230 35.1	16.3	115 16.4	03.5	26 18.9	104	19 11.2	+95
	5	341 53.4	217 24.8	37.3	67 04.0	19.0	245 37.0	16.2	130 18.9	03.5	40 48.3	105	19 01.7	+96
	6	356 55.9	232 24.2	+21 36.7	82 07.2	−27 19.2	260 38.8	+23 16.2	145 21.4	−10 03.5	55 17.8	105	−18 52.1	+96
	7	11 58.3	247 23.5	36.0	97 10.5	19.4	275 40.7	16.2	160 24.0	03.5	69 47.3	105	18 42.5	+98
	8	27 00.8	262 22.9	35.4	112 13.8	19.6	290 42.5	16.2	175 26.5	03.5	84 16.8	105	18 32.7	+99
	9	42 03.3	277 22.3	·· 34.7	127 17.0	·· 19.7	305 44.4	·· 16.2	190 29.0	·· 03.4	98 46.3	106	·18 22.8	+100
	10	57 05.7	292 21.6	34.0	142 20.3	19.9	320 46.2	16.1	205 31.6	03.4	113 15.9	107	18 12.8	+101
	11	72 08.2	307 21.0	33.4	157 23.6	20.1	335 48.1	16.1	220 34.1	03.4	127 45.6	107	18 02.7	+101
	12	87 10.7	322 20.4	+21 32.7	172 26.8	−27 20.3	350 49.9	+23 16.1	235 36.6	−10 03.4	142 15.3	107	−17 52.6	+103
	13	102 13.1	337 19.7	32.0	187 30.1	20.5	5 51.8	16.1	250 39.2	03.4	156 45.0	107	17 42.3	+104
	14	117 15.6	352 19.1	31.3	202 33.4	20.6	20 53.6	16.1	265 41.7	03.4	171 14.7	109	17 31.9	+105
	15	132 18.1	7 18.5	·· 30.7	217 36.6	·· 20.8	35 55.5	·· 16.0	280 44.2	·· 03.4	185 44.6	108	·17 21.4	+105
	16	147 20.5	22 17.9	30.0	232 39.9	21.0	50 57.3	16.0	295 46.8	03.3	200 14.4	109	17 10.9	+107
	17	162 23.0	37 17.2	29.3	247 43.2	21.2	65 59.2	16.0	310 49.3	03.3	214 44.3	109	17 00.2	+108
	18	177 25.5	52 16.6	+21 28.7	262 46.5	−27 21.3	81 01.0	+23 16.0	325 51.8	−10 03.3	229 14.2	110	−16 49.4	+108
	19	192 27.9	67 16.0	28.0	277 49.7	21.5	96 02.9	16.0	340 54.4	03.3	243 44.2	110	16 38.6	+110
	20	207 30.4	82 15.3	27.3	292 53.0	21.7	111 04.7	15.9	355 56.9	03.3	258 14.2	110	16 27.6	+110
	21	222 32.8	97 14.7	·· 26.6	307 56.3	·· 21.9	126 06.6	·· 15.9	10 59.4	·· 03.3	272 44.2	111	·16 16.6	+111
	22	237 35.3	112 14.1	26.0	322 59.6	22.0	141 08.4	15.9	26 02.0	03.3	287 14.3	111	16 05.5	+112
	23	252 37.8	127 13.5	25.3	338 02.8	22.2	156 10.3	15.9	41 04.5	03.3	301 44.4	112	15 54.3	+113
20	0	267 40.2	142 12.9	+21 24.6	353 06.1	−27 22.4	171 12.1	+23 15.8	56 07.0	−10 03.2	316 14.6	112	−15 43.0	+114
	1	282 42.7	157 12.2	23.9	8 09.4	22.6	186 14.0	15.8	71 09.6	03.2	330 44.8	112	15 31.6	+115
	2	297 45.2	172 11.6	23.2	23 12.7	22.7	201 15.8	15.8	86 12.1	03.2	345 15.0	113	15 20.1	+115
	3	312 47.6	187 11.0	·· 22.6	38 15.9	·· 22.9	216 17.6	·· 15.8	101 14.6	·· 03.2	359 45.3	113	·15 08.6	+117
	4	327 50.1	202 10.4	21.9	53 19.2	23.1	231 19.5	15.8	116 17.2	03.2	14 15.6	114	14 56.9	+117
	5	342 52.6	217 09.7	21.2	68 22.5	23.3	246 21.3	15.7	131 19.7	03.2	28 46.0	114	14 45.2	+118
	6	357 55.0	232 09.1	+21 20.5	83 25.8	−27 23.4	261 23.2	+23 15.7	146 22.2	−10 03.2	43 16.4	114	−14 33.4	+119
	7	12 57.5	247 08.5	19.8	98 29.1	23.6	276 25.0	15.7	161 24.7	03.1	57 46.8	115	14 21.5	+119
	8	27 59.9	262 07.9	19.1	113 32.3	23.8	291 26.9	15.7	176 27.3	03.1	72 17.3	115	14 09.6	+121
	9	43 02.4	277 07.3	·· 18.4	128 35.6	·· 24.0	306 28.7	·· 15.7	191 29.8	·· 03.1	86 47.8	115	·13 57.5	+121
	10	58 04.9	292 06.6	17.8	143 38.9	24.1	321 30.6	15.6	206 32.3	03.1	101 18.3	116	13 45.4	+122
	11	73 07.3	307 06.0	17.1	158 42.2	24.3	336 32.4	15.6	221 34.9	03.1	115 48.9	116	13 33.2	+123
	12	88 09.8	322 05.4	+21 16.4	173 45.5	−27 24.5	351 34.3	+23 15.6	236 37.4	−10 03.1	130 19.5	116	−13 20.9	+123
	13	103 12.3	337 04.8	15.7	188 48.8	24.7	6 36.1	15.6	251 39.9	03.1	144 50.1	117	13 08.6	+124
	14	118 14.7	352 04.2	15.0	203 52.1	24.8	21 38.0	15.5	266 42.5	03.1	159 20.8	117	12 56.2	+125
	15	133 17.2	7 03.6	·· 14.3	218 55.3	·· 25.0	36 39.8	·· 15.5	281 45.0	·· 03.0	173 51.5	117	·12 43.7	+126
	16	148 19.7	22 03.0	13.6	233 58.6	25.2	51 41.7	15.5	296 47.5	03.0	188 22.2	117	12 31.1	+126
	17	163 22.1	37 02.3	12.9	249 01.9	25.3	66 43.5	15.5	311 50.0	03.0	202 52.9	118	12 18.5	+127
	18	178 24.6	52 01.7	+21 12.2	264 05.2	−27 25.5	81 45.4	+23 15.5	326 52.6	−10 03.0	217 23.7	119	−12 05.8	+128
	19	193 27.1	67 01.1	11.5	279 08.5	25.7	96 47.2	15.4	341 55.1	03.0	231 54.6	118	11 53.0	+128
	20	208 29.5	82 00.5	10.8	294 11.8	25.9	111 49.1	15.4	356 57.6	03.0	246 25.4	119	11 40.2	+129
	21	223 32.0	96 59.9	·· 10.1	309 15.1	·· 26.0	126 50.9	·· 15.4	12 00.2	·· 03.0	260 56.3	119	·11 27.3	+130
	22	238 34.4	111 59.3	09.4	324 18.4	26.2	141 52.8	15.4	27 02.7	03.0	275 27.2	119	11 14.3	+130
	23	253 36.9	126 58.7	08.7	339 21.7	26.4	156 54.6	15.3	42 05.2	03.0	289 58.1	120	11 01.3	+131
	24	268 39.4	141 58.1	+21 08.0	354 25.0	−27 26.5	171 56.5	+23 15.3	57 07.7	−10 02.9	304 29.1	119	−10 48.2	+132
code		–	−7	−7	+33	−2	+19	0	+26	0				

GMT		SUN GHA		Dec.
	h	° ′		° ′
18	0	179 48.6	+23	23.5
	1	194 48.4		23.6
	2	209 48.3		23.6
	3	224 48.2	··	23.7
	4	239 48.0		23.8
	5	254 47.9		23.8
	6	269 47.8	+23	23.9
	7	284 47.6		24.0
	8	299 47.5		24.0
	9	314 47.4	··	24.1
	10	329 47.2		24.2
	11	344 47.1		24.2
	12	359 47.0	+23	24.3
	13	14 46.8		24.3
	14	29 46.7		24.4
	15	44 46.6	··	24.5
	16	59 46.4		24.5
	17	74 46.3		24.6
	18	89 46.2	+23	24.6
	19	104 46.0		24.7
	20	119 45.9		24.7
	21	134 45.8	··	24.8
	22	149 45.6		24.8
	23	164 45.5		24.9
19	0	179 45.4	+23	24.9
	1	194 45.2		25.0
	2	209 45.1		25.0
	3	224 44.9	··	25.1
	4	239 44.8		25.1
	5	254 44.7		25.2
	6	269 44.5	+23	25.2
	7	284 44.4		25.3
	8	299 44.3		25.3
	9	314 44.1	··	25.4
	10	329 44.0		25.4
	11	344 43.9		25.5
	12	359 43.7	+23	25.5
	13	14 43.6		25.5
	14	29 43.5		25.6
	15	44 43.3	··	25.6
	16	59 43.2		25.7
	17	74 43.1		25.7
	18	89 42.9	+23	25.7
	19	104 42.8		25.8
	20	119 42.7		25.8
	21	134 42.5	··	25.9
	22	149 42.4		25.9
	23	164 42.2		25.9
20	0	179 42.1	+23	26.0
	1	194 42.0		26.0
	2	209 41.8		26.0
	3	224 41.7	··	26.1
	4	239 41.6		26.1
	5	254 41.4		26.1
	6	269 41.3	+23	26.1
	7	284 41.2		26.2
	8	299 41.0		26.2
	9	314 40.9	··	26.2
	10	329 40.8		26.3
	11	344 40.6		26.3
	12	359 40.5	+23	26.3
	13	14 40.4		26.3
	14	29 40.2		26.4
	15	44 40.1	··	26.4
	16	59 39.9		26.4
	17	74 39.8		26.4
	18	89 39.7	+23	26.4
	19	104 39.5		26.5
	20	119 39.4		26.5
	21	134 39.3	··	26.5
	22	149 39.1		26.5
	23	164 39.0		26.5
	24	179 38.9	+23	26.6
code		—		0

No.	STARS Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 52.1	−40 28.9
5	Achernar	335 59.7	−57 27.7
30	Acrux	173 58.9	−62 51.2
19	Adhara	255 47.7	−28 54.6
10	Aldebaran	291 40.5	+16 25.2
32	Alioth	166 59.1	+56 12.6
34	Alkaid	153 33.3	+49 32.5
55	Al Na'ir	28 38.8	−47 10.6
15	Alnilam	276 31.6	− 1 13.7
25	Alphard	218 39.7	− 8 27.7
41	Alphecca	126 48.1	+26 52.0
1	Alpheratz	358 29.4	+28 50.3
51	Altair	62 51.0	+ 8 44.8
2	Ankaa	353 59.2	−42 32.8
42	Antares	113 20.2	−26 20.1
37	Arcturus	146 35.8	+19 25.1
43	Atria	109 01.2	−68 57.0
22	Avior	234 36.8	−59 22.0
13	Bellatrix	279 19.8	+ 6 18.6
16	Betelg'se	271 49.5	+ 7 24.1
17	Canopus	264 16.4	−52 40.2
12	Capella	281 40.3	+45 57.2
53	Deneb	50 01.3	+45 06.9
28	Denebola	183 18.7	+14 49.6
4	Diphda	349 40.3	−18 14.0
27	Dubhe	194 45.8	+62 00.0
14	Elnath	279 08.9	+28 34.3
47	Eltanin	91 06.1	+51 29.6
54	Enif	34 30.3	+ 9 39.9
56	Fomalhaut	16 12.5	−29 51.6
31	Gacrux	172 50.3	−56 51.9
29	Gienah	176 37.8	−17 17.6
35	Hadar	149 50.5	−60 09.6
6	Hamal	328 50.9	+23 14.9
48	Kaus Aust.	84 42.0	−34 24.5
40	Kochab	137 16.8	+74 20.6
57	Markab	14 22.3	+14 57.6
8	Menkar	315 01.6	+ 3 54.8
36	Menkent	148 59.6	−36 09.1
24	Miapl'dus	221 50.0	−69 32.1
9	Mirfak	309 44.2	+49 42.0
50	Nunki	76 52.7	−26 21.3
52	Peacock	54 28.2	−56 52.8
21	Pollux	244 22.1	+28 08.3
20	Procyon	245 46.3	+ 5 20.6
46	R'alhague	96 47.1	+12 35.5
26	Regulus	208 30.7	+12 11.4
11	Rigel	281 54.9	− 8 15.1
38	Rigil Kent.	140 51.9	−60 39.3
44	Sabik	103 02.9	−15 40.3
3	Schedar	350 31.3	+56 17.1
45	Shaula	97 21.5	−37 04.4
18	Sirius	259 13.0	−16 39.1
33	Spica	159 17.8	−10 55.6
23	Suhail	223 25.4	−43 15.1
49	Vega	81 08.5	+38 44.4
39	Zub'g'bi	137 54.2	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 18	19	20	21
N °	h m	h m	h m	h m	h m	h m
72	□	□	■	■	0 56	{0 08 / 23 37}
70	□	□	■	1 27	{0 19 / 23 51}	23 29
68	□	□	■	{0 21 / 23 54}	23 37	23 23
66	□	□	{0 05 / 23 45}	23 34	23 25	23 18
64	1 31	////	23 19	23 18	23 16	23 13
62	2 09	////	22 58	23 04	23 07	23 10
60	2 35	////	22 41	22 53	23 00	23 06
58	2 56	////	22 27	22 43	22 54	23 03
56	3 13	////	22 15	22 34	22 48	23 00
54	3 27	////	22 05	22 26	22 43	22 58
52	3 39	////	21 55	22 19	22 39	22 56
50	3 50	////	21 47	22 13	22 34	22 54
45	4 13	1 40	21 28	21 59	22 25	22 49
40	4 31	2 28	21 14	21 48	22 18	22 45
35	4 46	2 59	21 01	21 38	22 11	22 42
30	4 59	3 22	20 50	21 29	22 05	22 39
20	5 21	3 57	20 31	21 14	21 55	22 34
10	5 40	4 22	20 14	21 02	21 46	22 30
0	5 57	4 42	19 59	20 49	21 38	22 26
10	6 15	5 00	19 43	20 37	21 30	22 22
20	6 34	5 14	19 26	20 24	21 21	22 17
30	6 55	5 29	19 07	20 09	21 10	22 12
35	7 07	5 36	18 56	20 00	21 04	22 09
40	7 21	5 43	18 43	19 50	20 58	22 06
45	7 38	5 51	18 28	19 38	20 50	22 02
50	7 59	5 59	18 09	19 24	20 40	21 57
52	8 09	6 03	18 00	19 17	20 36	21 55
54	8 20	6 07	17 50	19 09	20 31	21 53
56	8 33	6 10	17 38	19 01	20 25	21 50
58	8 48	6 14	17 25	18 51	20 19	21 47
60	9 05	6 19	17 09	18 40	20 12	21 44
S						

Lat.	Sunset	Twlt. ends	Moonset 18	19	20	21
N °	h m	h m	h m	h m	h m	h m
72	□	□	■	■	5 28	7 58
70	□	□	■	3 10	6 03	8 13
68	□	□	■	4 16	6 27	8 25
66	□	□	2 43	4 51	6 46	8 35
64	22 32	////	3 30	5 16	7 01	8 43
62	21 53	////	4 00	5 36	7 13	8 50
60	21 27	////	4 22	5 52	7 24	8 56
58	21 07	////	4 41	6 05	7 33	9 01
56	20 50	////	4 56	6 17	7 41	9 06
54	20 35	////	5 09	6 27	7 48	9 10
52	20 23	////	5 20	6 36	7 54	9 14
50	20 12	////	5 31	6 44	8 00	9 17
45	19 50	22 23	5 52	7 01	8 12	9 24
40	19 32	21 35	6 09	7 15	8 22	9 30
35	19 17	21 04	6 23	7 27	8 31	9 35
30	19 03	20 40	6 36	7 37	8 38	9 40
20	18 41	20 05	6 57	7 54	8 51	9 48
10	18 22	19 40	7 15	8 09	9 02	9 55
0	18 05	19 20	7 32	8 23	9 13	10 01
10	17 48	19 03	7 49	8 37	9 23	10 07
20	17 29	18 48	8 07	8 52	9 34	10 14
30	17 08	18 34	8 27	9 09	9 46	10 21
35	16 55	18 26	8 39	9 19	9 53	10 25
40	16 41	18 19	8 53	9 30	10 01	10 30
45	16 24	18 11	9 09	9 43	10 11	10 36
50	16 04	18 04	9 29	9 58	10 22	10 42
52	15 54	18 00	9 39	10 06	10 27	10 45
54	15 43	17 57	9 49	10 14	10 33	10 49
56	15 30	17 52	10 01	10 23	10 39	10 52
58	15 15	17 48	10 15	10 33	10 46	10 56
60	14 58	17 44	10 31	10 45	10 54	11 01
S						

GMT	Equation of Time (App.—Mean) 18	19	20
h	m s	m s	m s
0	− 0 45.4	− 0 58.3	− 1 11.3
6	− 0 48.6	− 1 01.6	− 1 14.5
12	− 0 51.9	− 1 04.8	− 1 17.8
18	− 0 55.1	− 1 08.0	− 1 21.0
24	− 0 58.3	− 1 11.3	− 1 24.3

GMT of Transit
Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
18	1 19	14 30	0 38	12 40	20 20
19	2 11	14 31	0 33	12 37	20 16
20	3 01	14 32	0 28	12 34	20 12
21	3 50	14 33	0 22	12 31	20 08

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
° 0	′	′	′
	0.1	0.1	0.3
30			
	0.1	0.1	0.3
45			
	0.1	0.1	0.2
60			
	0.1	0.0	0.1
75			
	0.1	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	18	19	20
° 0	′	′	′
	14.8	15.4	16.1
4			
	14.8	15.4	16.1
8			
	14.8	15.4	16.1
12			
	14.8	15.4	16.0
16			
	14.8	15.4	16.0
20			
	14.8	15.4	16.0
24			
	14.8	15.4	16.0
28			
	14.9	15.4	16.0
32			
	14.9	15.4	16.0
36			
	14.9	15.4	16.0
40			
	14.9	15.4	16.0
44			
	15.0	15.5	15.9
48			
	15.0	15.5	15.9
52			
	15.0	15.5	15.9
56			
	15.1	15.5	15.9
60			
	15.1	15.5	15.8
64			
	15.1	15.5	15.8
68			
	15.2	15.5	15.8
72			
	15.2	15.5	15.8
76			
	15.3	15.5	15.7
80			
	15.3	15.5	15.7
84			
	15.3	15.5	15.7
88			
	15.4	15.5	15.7
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	18	19	20
° 0	′	′	′
	16.0	15.6	15.3
4			
	16.0	15.6	15.3
8			
	16.0	15.6	15.3
12			
	16.0	15.6	15.3
16			
	16.0	15.6	15.3
20			
	15.9	15.6	15.3
24			
	15.9	15.6	15.3
28			
	15.9	15.6	15.3
32			
	15.9	15.6	15.3
36			
	15.9	15.6	15.3
40			
	15.8	15.6	15.4
44			
	15.8	15.6	15.4
48			
	15.8	15.6	15.4
52			
	15.7	15.6	15.4
56			
	15.7	15.6	15.4
60			
	15.7	15.6	15.5
64			
	15.6	15.6	15.5
68			
	15.6	15.6	15.5
72			
	15.6	15.6	15.5
76			
	15.5	15.5	15.6
80			
	15.5	15.5	15.6
84			
	15.4	15.5	15.6
88			
	15.4	15.5	15.7
90			

Subtract from table, back cover

Day	GMT	♈ GHA	VENUS −3.4 GHA	Dec.	MARS −2.2 GHA	Dec.	JUPITER −1.4 GHA	Dec.	SATURN 0.7 GHA	Dec.	MOON GHA	code	Dec.	code
	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
21	0	268 39.4	141 58.1	+21 08.0	354 25.0	−27 26.5	171 56.5	+23 15.3	57 07.7	−10 02.9	304 29.1	119	−10 48.2	+132
	1	283 41.8	156 57.5	07.3	9 28.2	26.7	186 58.3	15.3	72 10.3	02.9	319 00.0	120	10 35.0	+132
	2	298 44.3	171 56.9	06.6	24 31.5	26.9	202 00.2	15.3	87 12.8	02.9	333 31.0	121	10 21.8	+133
	3	313 46.8	186 56.3	·· 05.9	39 34.8	·· 27.0	217 02.0	·· 15.3	102 15.3	·· 02.9	348 02.1	120	·10 08.5	+133
	4	328 49.2	201 55.6	05.2	54 38.1	27.2	232 03.9	15.2	117 17.9	02.9	2 33.1	121	9 55.2	+134
	5	343 51.7	216 55.0	04.5	69 41.4	27.4	247 05.7	15.2	132 20.4	02.9	17 04.2	121	9 41.8	+135
	6	358 54.2	231 54.4	+21 03.8	84 44.7	−27 27.6	262 07.6	+23 15.2	147 22.9	−10 02.9	31 35.3	121	− 9 28.3	+135
	7	13 56.6	246 53.8	03.1	99 48.0	27.7	277 09.4	15.2	162 25.4	02.9	46 06.4	121	9 14.8	+135
	8	28 59.1	261 53.2	02.3	114 51.3	27.9	292 11.3	15.1	177 28.0	02.9	60 37.5	122	9 01.3	+137
	9	44 01.6	276 52.6	·· 01.6	129 54.6	·· 28.1	307 13.1	·· 15.1	192 30.5	·· 02.8	75 08.7	122	· 8 47.6	+136
	10	59 04.0	291 52.0	00.9	144 57.9	28.2	322 15.0	15.1	207 33.0	02.8	89 39.9	121	8 34.0	+137
	11	74 06.5	306 51.4	21 00.2	160 01.2	28.4	337 16.8	15.1	222 35.5	02.8	104 11.0	123	8 20.3	+138
	12	89 08.9	321 50.8	+20 59.5	175 04.5	−27 28.6	352 18.7	+23 15.1	237 38.1	−10 02.8	118 42.3	122	− 8 06.5	+138
	13	104 11.4	336 50.2	58.8	190 07.8	28.7	7 20.5	15.0	252 40.6	02.8	133 13.5	122	7 52.7	+139
	14	119 13.9	351 49.6	58.1	205 11.1	28.9	22 22.3	15.0	267 43.1	02.8	147 44.7	123	7 38.8	+139
	15	134 16.3	6 49.0	·· 57.3	220 14.4	·· 29.1	37 24.2	·· 15.0	282 45.6	·· 02.8	162 16.0	122	· 7 24.9	+139
	16	149 18.8	21 48.4	56.6	235 17.7	29.2	52 26.0	15.0	297 48.2	02.8	176 47.2	123	7 11.0	+140
	17	164 21.3	36 47.8	55.9	250 21.0	29.4	67 27.9	14.9	312 50.7	02.8	191 18.5	123	6 57.0	+141
	18	179 23.7	51 47.2	+20 55.2	265 24.3	−27 29.6	82 29.7	+23 14.9	327 53.2	−10 02.7	205 49.8	123	− 6 42.9	+141
	19	194 26.2	66 46.6	54.5	280 27.6	29.7	97 31.6	14.9	342 55.7	02.7	220 21.1	123	6 28.8	+141
	20	209 28.7	81 46.0	53.7	295 30.9	29.9	112 33.4	14.9	357 58.3	02.7	234 52.4	123	6 14.7	+142
	21	224 31.1	96 45.4	·· 53.0	310 34.2	·· 30.1	127 35.3	·· 14.8	13 00.8	·· 02.7	249 23.7	123	· 6 00.5	+142
	22	239 33.6	111 44.8	52.3	325 37.5	30.2	142 37.1	14.8	28 03.3	02.7	263 55.0	123	5 46.3	+142
	23	254 36.0	126 44.2	51.6	340 40.8	30.4	157 39.0	14.8	43 05.8	02.7	278 26.3	123	5 32.1	+143
22	0	269 38.5	141 43.7	+20 50.9	355 44.1	−27 30.6	172 40.8	+23 14.8	58 08.4	−10 02.7	292 57.6	123	− 5 17.8	+143
	1	284 41.0	156 43.1	50.1	10 47.4	30.7	187 42.7	14.8	73 10.9	02.7	307 28.9	124	5 03.5	+144
	2	299 43.4	171 42.5	49.4	25 50.7	30.9	202 44.5	14.7	88 13.4	02.7	322 00.3	123	4 49.1	+143
	3	314 45.9	186 41.9	·· 48.7	40 54.1	·· 31.1	217 46.4	·· 14.7	103 15.9	·· 02.6	336 31.6	123	· 4 34.8	+144
	4	329 48.4	201 41.3	47.9	55 57.4	31.2	232 48.2	14.7	118 18.5	02.6	351 02.9	124	4 20.4	+145
	5	344 50.8	216 40.7	47.2	71 00.7	31.4	247 50.1	14.7	133 21.0	02.6	5 34.3	123	4 05.9	+145
	6	359 53.3	231 40.1	+20 46.5	86 04.0	−27 31.6	262 51.9	+23 14.6	148 23.5	−10 02.6	20 05.6	123	− 3 51.4	+145
	7	14 55.8	246 39.5	45.7	101 07.3	31.7	277 53.8	14.6	163 26.0	02.6	34 36.9	124	3 36.9	+145
	8	29 58.2	261 38.9	45.0	116 10.6	31.9	292 55.6	14.6	178 28.6	02.6	49 08.3	123	3 22.4	+146
	9	45 00.7	276 38.3	·· 44.3	131 13.9	·· 32.0	307 57.5	·· 14.6	193 31.1	·· 02.6	63 39.6	123	· 3 07.8	+145
	10	60 03.2	291 37.7	43.5	146 17.2	32.2	322 59.3	14.5	208 33.6	02.6	78 10.9	123	2 53.3	+146
	11	75 05.6	306 37.2	42.8	161 20.5	32.4	338 01.2	14.5	223 36.1	02.6	92 42.2	123	2 38.7	+147
	12	90 08.1	321 36.6	+20 42.1	176 23.8	−27 32.5	353 03.0	+23 14.5	238 38.6	−10 02.6	107 13.5	123	− 2 24.0	+146
	13	105 10.5	336 36.0	41.3	191 27.1	32.7	8 04.9	14.5	253 41.2	02.5	121 44.8	123	2 09.4	+147
	14	120 13.0	351 35.4	40.6	206 30.5	32.9	23 06.7	14.4	268 43.7	02.5	136 16.1	122	1 54.7	+147
	15	135 15.5	6 34.8	·· 39.9	221 33.8	·· 33.0	38 08.6	·· 14.4	283 46.2	·· 02.5	150 47.3	123	· 1 40.0	+147
	16	150 17.9	21 34.2	39.1	236 37.1	33.2	53 10.4	14.4	298 48.7	02.5	165 18.6	122	1 25.3	+147
	17	165 20.4	36 33.7	38.4	251 40.4	33.3	68 12.2	14.4	313 51.3	02.5	179 49.8	123	1 10.6	+147
	18	180 22.9	51 33.1	+20 37.6	266 43.7	−27 33.5	83 14.1	+23 14.4	328 53.8	−10 02.5	194 21.1	122	− 0 55.9	+148
	19	195 25.3	66 32.5	36.9	281 47.0	33.7	98 15.9	14.3	343 56.3	02.5	208 52.3	122	0 41.1	+147
	20	210 27.8	81 31.9	36.1	296 50.3	33.8	113 17.8	14.3	358 58.8	02.5	223 23.5	122	0 26.4	+148
	21	225 30.3	96 31.3	·· 35.4	311 53.7	·· 34.0	128 19.6	·· 14.3	14 01.3	·· 02.5	237 54.7	121	− 0 11.6	+148
	22	240 32.7	111 30.7	34.7	326 57.0	34.2	143 21.5	14.3	29 03.9	02.5	252 25.8	122	+ 0 03.2	+148
	23	255 35.2	126 30.2	33.9	342 00.3	34.3	158 23.3	14.2	44 06.4	02.5	266 57.0	121	0 18.0	+148
23	0	270 37.7	141 29.6	+20 33.2	357 03.6	−27 34.5	173 25.2	+23 14.2	59 08.9	−10 02.4	281 28.1	121	+ 0 32.8	+148
	1	285 40.1	156 29.0	32.4	12 06.9	34.6	188 27.0	14.2	74 11.4	02.4	295 59.2	120	0 47.6	+148
	2	300 42.6	171 28.4	31.7	27 10.2	34.8	203 28.9	14.2	89 13.9	02.4	310 30.2	121	1 02.4	+148
	3	315 45.0	186 27.9	·· 30.9	42 13.6	·· 35.0	218 30.7	·· 14.1	104 16.5	·· 02.4	325 01.3	120	· 1 17.2	+149
	4	330 47.5	201 27.3	30.2	57 16.9	35.1	233 32.6	14.1	119 19.0	02.4	339 32.3	120	1 32.1	+148
	5	345 50.0	216 26.7	29.4	72 20.2	35.3	248 34.4	14.1	134 21.5	02.4	354 03.3	119	1 46.9	+148
	6	0 52.4	231 26.1	+20 28.6	87 23.5	−27 35.4	263 36.3	+23 14.1	149 24.0	−10 02.4	8 34.2	120	+ 2 01.7	+148
	7	15 54.9	246 25.6	27.9	102 26.8	35.6	278 38.1	14.0	164 26.5	02.4	23 05.2	119	2 16.5	+149
	8	30 57.4	261 25.0	27.1	117 30.1	35.8	293 40.0	14.0	179 29.1	02.4	37 36.1	119	2 31.4	+148
	9	45 59.8	276 24.4	·· 26.4	132 33.5	·· 35.9	308 41.8	·· 14.0	194 31.6	·· 02.4	52 07.0	118	· 2 46.2	+148
	10	61 02.3	291 23.8	25.6	147 36.8	36.1	323 43.7	14.0	209 34.1	02.4	66 37.8	118	3 01.0	+148
	11	76 04.8	306 23.3	24.9	162 40.1	36.2	338 45.5	13.9	224 36.6	02.4	81 08.6	118	3 15.8	+148
	12	91 07.2	321 22.7	+20 24.1	177 43.4	−27 36.4	353 47.4	+23 13.9	239 39.1	−10 02.3	95 39.4	117	+ 3 30.6	+148
	13	106 09.7	336 22.1	23.3	192 46.8	36.5	8 49.2	13.9	254 41.7	02.3	110 10.1	117	3 45.4	+148
	14	121 12.1	351 21.6	22.6	207 50.1	36.7	23 51.1	13.9	269 44.2	02.3	124 40.8	116	4 00.2	+148
	15	136 14.6	6 21.0	·· 21.8	222 53.4	·· 36.9	38 52.9	·· 13.8	284 46.7	·· 02.3	139 11.4	117	· 4 15.0	+147
	16	151 17.1	21 20.4	21.1	237 56.7	37.0	53 54.7	13.8	299 49.2	02.3	153 42.1	115	4 29.7	+148
	17	166 19.5	36 19.8	20.3	253 00.0	37.2	68 56.6	13.8	314 51.7	02.3	168 12.6	116	4 44.5	+147
	18	181 22.0	51 19.3	+20 19.5	268 03.4	−27 37.3	83 58.4	+23 13.8	329 54.2	−10 02.3	182 43.2	114	+ 4 59.2	+147
	19	196 24.5	66 18.7	18.8	283 06.7	37.5	99 00.3	13.7	344 56.8	02.3	197 13.6	115	5 13.9	+147
	20	211 26.9	81 18.1	18.0	298 10.0	37.6	114 02.1	13.7	359 59.3	02.3	211 44.1	114	5 28.6	+147
	21	226 29.4	96 17.6	·· 17.2	313 13.3	·· 37.8	129 04.0	·· 13.7	15 01.8	·· 02.3	226 14.5	113	· 5 43.3	+146
	22	241 31.9	111 17.0	16.5	328 16.7	37.9	144 05.8	13.7	30 04.3	02.3	240 44.8	113	5 57.9	+147
	23	256 34.3	126 16.5	15.7	343 20.0	38.1	159 07.7	13.6	45 06.8	02.3	255 15.1	113	6 12.6	+146
	24	271 36.8	141 15.9	+20 14.9	358 23.3	−27 38.3	174 09.5	+23 13.6	60 09.4	−10 02.2	269 45.4	112	+ 6 27.2	+145
	code	—	− 6	− 8	+ 33	− 2	+ 19	0	+ 26	+ 1				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
21 0	179 38.9	+23 26.6
1	194 38.7	26.6
2	209 38.6	26.6
3	224 38.5	•• 26.6
4	239 38.3	26.6
5	254 38.2	26.6
6	269 38.0	+23 26.6
7	284 37.9	26.7
8	299 37.8	26.7
9	314 37.6	•• 26.7
10	329 37.5	26.7
11	344 37.4	26.7
12	359 37.2	+23 26.7
13	14 37.1	26.7
14	29 37.0	26.7
15	44 36.8	•• 26.7
16	59 36.7	26.7
17	74 36.6	26.7
18	89 36.4	+23 26.7
19	104 36.3	26.7
20	119 36.1	26.7
21	134 36.0	•• 26.7
22	149 35.9	26.8
23	164 35.7	26.8
22 0	179 35.6	+23 26.8
1	194 35.5	26.7
2	209 35.3	26.7
3	224 35.2	•• 26.7
4	239 35.1	26.7
5	254 34.9	26.7
6	269 34.8	+23 26.7
7	284 34.7	26.7
8	299 34.5	26.7
9	314 34.4	•• 26.7
10	329 34.3	26.7
11	344 34.1	26.7
12	359 34.0	+23 26.7
13	14 33.8	26.7
14	29 33.7	26.7
15	44 33.6	•• 26.7
16	59 33.4	26.6
17	74 33.3	26.6
18	89 33.2	+23 26.6
19	104 33.0	26.6
20	119 32.9	26.6
21	134 32.8	•• 26.6
22	149 32.6	26.6
23	164 32.5	26.5
23 0	179 32.4	+23 26.5
1	194 32.2	26.5
2	209 32.1	26.5
3	224 32.0	•• 26.5
4	239 31.8	26.4
5	254 31.7	26.4
6	269 31.5	+23 26.4
7	284 31.4	26.4
8	299 31.3	26.4
9	314 31.1	•• 26.3
10	329 31.0	26.3
11	344 30.9	26.3
12	359 30.7	+23 26.3
13	14 30.6	26.2
14	29 30.5	26.2
15	44 30.3	•• 26.2
16	59 30.2	26.1
17	74 30.1	26.1
18	89 29.9	+23 26.1
19	104 29.8	26.1
20	119 29.7	26.0
21	134 29.5	•• 26.0
22	149 29.4	26.0
23	164 29.2	25.9
24	179 29.1	+23 25.9
code	—	0

No.	STARS Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 52.1	−40 28.9
5	Achernar	335 59.7	−57 27.7
30	Acrux	173 58.9	−62 51.2
19	Adhara	255 47.7	−28 54.6
10	Aldebaran	291 40.5	+16 25.2
32	Alioth	166 59.1	+56 12.6
34	Alkaid	153 33.3	+49 32.5
55	Al Na'ir	28 38.8	−47 10.6
15	Alnilam	276 31.6	− 1 13.7
25	Alphard	218 39.7	− 8 27.7
41	Alphecca	126 48.1	+26 52.0
1	Alpheratz	358 29.3	+28 50.3
51	Altair	62 51.0	+ 8 44.8
2	Ankaa	353 59.2	−42 32.8
42	Antares	113 20.2	−26 20.1
37	Arcturus	146 35.8	+19 25.1
43	Atria	109 01.2	−68 57.0
22	Avior	234 36.8	−59 21.9
13	Bellatrix	279 19.8	+ 6 18.6
16	Betelg'se	271 49.5	+ 7 24.1
17	Canopus	264 16.3	−52 40.2
12	Capella	281 40.3	+45 57.2
53	Deneb	50 01.3	+45 06.9
28	Denebola	183 18.7	+14 49.6
4	Diphda	349 40.2	−18 14.0
27	Dubhe	194 45.8	+62 00.0
14	Elnath	279 08.9	+28 34.3
47	Eltanin	91 06.1	+51 29.6
54	Enif	34 30.3	+ 9 40.0
56	Fomalhaut	16 12.5	−29 51.6
31	Gacrux	172 50.3	−56 51.9
29	Gienah	176 37.8	−17 17.6
35	Hadar	149 50.5	−60 09.6
6	Hamal	328 50.9	+23 14.9
48	Kaus Aust.	84 42.0	−34 24.5
40	Kochab	137 16.9	+74 20.6
57	Markab	14 22.3	+14 57.6
8	Menkar	315 01.5	+ 3 54.8
36	Menkent	148 59.6	−36 09.1
24	Miapl'dus	221 50.0	−69 32.1
9	Mirfak	309 44.2	+49 42.0
50	Nunki	76 52.7	−26 21.3
52	Peacock	54 28.2	−56 52.8
21	Pollux	244 22.1	+28 08.3
20	Procyon	245 46.3	+ 5 20.6
46	R'alhague	96 47.1	+12 35.5
26	Regulus	208 30.7	+12 11.4
11	Rigel	281 54.9	− 8 15.1
38	Rigil Kent.	140 51.9	−60 39.3
44	Sabik	103 02.9	−15 40.3
3	Schedar	350 31.2	+56 17.1
45	Shaula	97 21.5	−37 04.4
18	Sirius	259 13.0	−16 39.1
33	Spica	159 17.8	−10 55.6
23	Suhail	223 25.4	−43 15.1
49	Vega	81 08.5	+38 44.4
39	Zub'g'bi	137 54.2	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 21	22	23	24
N °	h m	h m	h m	h m	h m	h m
72	□	□	{0 08 / 23 37	23 10	22 43	22 10
70	□	□	23 29	23 10	22 52	22 29
68	□	□	23 23	23 11	22 58	22 44
66	□	□	23 18	23 11	23 04	22 56
64	1 31	////	23 13	23 11	23 09	23 07
62	2 09	////	23 10	23 11	23 13	23 16
60	2 35	////	23 06	23 11	23 17	23 24
58	2 56	////	23 03	23 11	23 20	23 31
56	3 13	////	23 00	23 12	23 23	23 37
54	3 27	////	22 58	23 12	23 26	23 42
52	3 40	////	22 56	23 12	23 28	23 47
50	3 50	////	22 54	23 12	23 31	23 51
45	4 13	1 40	22 49	23 12	23 36	24 01
40	4 31	2 28	22 45	23 12	23 40	24 09
35	4 46	2 59	22 42	23 12	23 43	24 16
30	4 59	3 22	22 39	23 12	23 46	24 23
20	5 21	3 57	22 34	23 13	23 52	24 34
10	5 40	4 22	22 30	23 13	23 57	24 43
0	5 58	4 43	22 26	23 13	24 02	0 02
10	6 16	5 00	22 22	23 13	24 06	0 06
20	6 34	5 15	22 17	23 14	24 12	0 12
30	6 55	5 29	22 12	23 14	24 17	0 17
35	7 08	5 37	22 09	23 14	24 21	0 21
40	7 22	5 44	22 06	23 15	24 25	0 25
45	7 39	5 52	22 02	23 15	24 29	0 29
50	8 00	5 59	21 57	23 15	24 35	0 35
52	8 10	6 03	21 55	23 16	24 37	0 37
54	8 21	6 06	21 53	23 16	24 40	0 40
56	8 33	6 11	21 50	23 16	24 43	0 43
58	8 48	6 15	21 47	23 16	24 47	0 47
60	9 06	6 19	21 44	23 17	24 51	0 51
S						

Lat.	Sunset	Twlt. ends	Moonset 21	22	23	24
N °	h m	h m	h m	h m	h m	h m
72	□	□	7 58	10 11	12 21	14 39
70	□	□	8 13	10 15	12 16	14 22
68	□	□	8 25	10 18	12 12	14 09
66	□	□	8 35	10 21	12 08	13 59
64	22 33	////	8 43	10 24	12 05	13 50
62	21 54	////	8 50	10 26	12 03	13 42
60	21 28	////	8 56	10 28	12 01	13 36
58	21 07	////	9 01	10 29	11 59	13 30
56	20 50	////	9 06	10 31	11 57	13 25
54	20 36	////	9 10	10 32	11 55	13 21
52	20 24	////	9 14	10 33	11 54	13 17
50	20 13	////	9 17	10 34	11 53	13 13
45	19 50	22 23	9 24	10 37	11 50	13 05
40	19 32	21 35	9 30	10 39	11 48	12 59
35	19 17	21 04	9 35	10 40	11 46	12 53
30	19 04	20 41	9 40	10 42	11 44	12 48
20	18 42	20 06	9 48	10 44	11 41	12 40
10	18 23	19 41	9 55	10 46	11 39	12 32
0	18 05	19 20	10 01	10 48	11 36	12 25
10	17 48	19 03	10 07	10 50	11 34	12 18
20	17 30	18 49	10 14	10 52	11 31	12 11
30	17 08	18 34	10 21	10 55	11 28	12 03
35	16 56	18 27	10 25	10 56	11 26	11 58
40	16 41	18 19	10 30	10 57	11 24	11 52
45	16 25	18 12	10 36	10 59	11 22	11 46
50	16 04	18 04	10 42	11 01	11 19	11 39
52	15 54	18 00	10 45	11 02	11 18	11 35
54	15 43	17 57	10 49	11 03	11 17	11 31
56	15 30	17 52	10 52	11 04	11 15	11 27
58	15 16	17 49	10 56	11 05	11 13	11 23
60	14 58	17 44	11 01	11 06	11 12	11 17
S						

GMT	Equation of Time (App.—Mean) 21	22	23
h	m s	m s	m s
0	− 1 24.3	− 1 37.3	− 1 50.3
6	− 1 27.5	− 1 40.6	− 1 53.5
12	− 1 30.8	− 1 43.8	− 1 56.8
18	− 1 34.1	− 1 47.1	− 2 00.0
24	− 1 37.3	− 1 50.3	− 2 03.3

GMT of Transit
Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
21	3 50	14 33	0 22	12 31	20 08
22	4 37	14 34	0 17	12 28	20 04
23	5 25	14 35	0 12	12 25	20 00
24	6 13	14 36	0 06	12 22	19 56

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.1	0.1	0.3
30			
	0.1	0.1	0.3
45			
	0.1	0.1	0.2
60			
	0.1	0.0	0.1
75			
	0.1	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	21	22	23
°	′	′	′
0			
	16.7	17.3	18.0
4			
	16.7	17.3	18.0
8			
	16.7	17.3	17.9
12			
	16.7	17.3	17.9
16			
	16.7	17.3	17.9
20			
	16.6	17.2	17.8
24			
	16.6	17.2	17.8
28			
	16.6	17.1	17.7
32			
	16.5	17.1	17.6
36			
	16.5	17.0	17.6
40			
	16.5	17.0	17.5
44			
	16.4	16.9	17.4
48			
	16.4	16.8	17.3
52			
	16.3	16.8	17.2
56			
	16.3	16.7	17.1
60			
	16.2	16.6	17.0
64			
	16.2	16.5	16.8
68			
	16.1	16.4	16.7
72			
	16.0	16.3	16.6
76			
	16.0	16.2	16.5
80			
	15.9	16.1	16.3
84			
	15.9	16.0	16.2
88			
	15.8	16.0	16.1
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	21	22	23
°	′	′	′
0			
	14.9	14.5	14.2
4			
	14.9	14.5	14.2
8			
	14.9	14.6	14.2
12			
	14.9	14.6	14.2
16			
	14.9	14.6	14.3
20			
	15.0	14.6	14.3
24			
	15.0	14.7	14.4
28			
	15.0	14.7	14.4
32			
	15.0	14.8	14.5
36			
	15.1	14.8	14.6
40			
	15.1	14.9	14.7
44			
	15.2	15.0	14.7
48			
	15.2	15.0	14.8
52			
	15.3	15.1	15.0
56			
	15.3	15.2	15.1
60			
	15.4	15.3	15.2
64			
	15.4	15.4	15.3
68			
	15.5	15.5	15.4
72			
	15.5	15.5	15.5
76			
	15.6	15.6	15.7
80			
	15.7	15.7	15.8
84			
	15.7	15.8	15.9
88			
	15.8	15.9	16.0
90			

Subtract from table, back cover

Last Quarter 23

GMT		♈ GHA	VENUS −3.4 GHA	VENUS Dec.	MARS −2.3 GHA	MARS Dec.	JUPITER −1.4 GHA	JUPITER Dec.	SATURN 0.7 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
24	0	271 36.8	141 15.9	+20 14.9	358 23.3	−27 38.3	174 09.5	+23 13.6	60 09.4	−10 02.2	269 45.4	112	+ 6 27.2	+145
	1	286 39.3	156 15.3	14.2	13 26.6	38.4	189 11.4	13.6	75 11.9	02.2	284 15.6	111	6 41.7	+146
	2	301 41.7	171 14.8	13.4	28 30.0	38.6	204 13.2	13.6	90 14.4	02.2	298 45.7	111	6 56.3	+145
	3	316 44.2	186 14.2	·· 12.6	43 33.3	·· 38.7	219 15.1	·· 13.5	105 16.9	·· 02.2	313 15.8	111	· 7 10.8	+145
	4	331 46.6	201 13.6	11.8	58 36.6	38.9	234 16.9	13.5	120 19.4	02.2	327 45.9	110	7 25.3	+145
	5	346 49.1	216 13.1	11.1	73 39.9	39.0	249 18.8	13.5	135 21.9	02.2	342 15.9	109	7 39.8	+144
	6	1 51.6	231 12.5	+20 10.3	88 43.3	−27 39.2	264 20.6	+23 13.5	150 24.5	−10 02.2	356 45.8	109	+ 7 54.2	+144
	7	16 54.0	246 12.0	09.5	103 46.6	39.3	279 22.5	13.4	165 27.0	02.2	11 15.7	108	8 08.6	+144
	8	31 56.5	261 11.4	08.7	118 49.9	39.5	294 24.3	13.4	180 29.5	02.2	25 45.5	107	8 23.0	+143
	9	46 59.0	276 10.8	·· 08.0	133 53.3	·· 39.6	309 26.2	·· 13.4	195 32.0	·· 02.2	40 15.2	107	· 8 37.3	+143
	10	62 01.4	291 10.3	07.2	148 56.6	39.8	324 28.0	13.4	210 34.5	02.2	54 44.9	107	8 51.6	+143
	11	77 03.9	306 09.7	06.4	163 59.9	39.9	339 29.9	13.3	225 37.0	02.2	69 14.6	106	9 05.9	+142
	12	92 06.4	321 09.2	+20 05.6	179 03.2	−27 40.1	354 31.7	+23 13.3	240 39.5	−10 02.2	83 44.2	105	+ 9 20.1	+142
	13	107 08.8	336 08.6	04.8	194 06.6	40.2	9 33.5	13.3	255 42.1	02.2	98 13.7	104	9 34.3	+141
	14	122 11.3	351 08.1	04.0	209 09.9	40.4	24 35.4	13.3	270 44.6	02.1	112 43.1	104	9 48.4	+141
	15	137 13.8	6 07.5	·· 03.3	224 13.2	·· 40.6	39 37.2	·· 13.2	285 47.1	·· 02.1	127 12.5	103	·10 02.5	+140
	16	152 16.2	21 07.0	02.5	239 16.6	40.7	54 39.1	13.2	300 49.6	02.1	141 41.8	103	10 16.5	+140
	17	167 18.7	36 06.4	01.7	254 19.9	40.9	69 40.9	13.2	315 52.1	02.1	156 11.1	101	10 30.5	+140
	18	182 21.1	51 05.9	+20 00.9	269 23.2	−27 41.0	84 42.8	+23 13.2	330 54.6	−10 02.1	170 40.2	101	+10 44.5	+138
	19	197 23.6	66 05.3	20 00.1	284 26.6	41.2	99 44.6	13.1	345 57.1	02.1	185 09.3	101	10 58.3	+139
	20	212 26.1	81 04.8	19 59.3	299 29.9	41.3	114 46.5	13.1	0 59.7	02.1	199 38.4	99	11 12.2	+138
	21	227 28.5	96 04.2	·· 58.5	314 33.2	·· 41.5	129 48.3	·· 13.1	16 02.2	·· 02.1	214 07.3	99	·11 26.0	+137
	22	242 31.0	111 03.7	57.8	329 36.6	41.6	144 50.2	13.0	31 04.7	02.1	228 36.2	99	11 39.7	+136
	23	257 33.5	126 03.1	57.0	344 39.9	41.8	159 52.0	13.0	46 07.2	02.1	243 05.1	97	11 53.3	+136
25	0	272 35.9	141 02.6	+19 56.2	359 43.2	−27 41.9	174 53.9	+23 13.0	61 09.7	−10 02.1	257 33.8	97	+12 06.9	+136
	1	287 38.4	156 02.0	55.4	14 46.6	42.1	189 55.7	13.0	76 12.2	02.1	272 02.5	96	12 20.5	+135
	2	302 40.9	171 01.5	54.6	29 49.9	42.2	204 57.6	12.9	91 14.7	02.1	286 31.1	95	12 34.0	+134
	3	317 43.3	186 00.9	·· 53.8	44 53.2	·· 42.3	219 59.4	·· 12.9	106 17.3	·· 02.1	300 59.6	94	·12 47.4	+133
	4	332 45.8	201 00.4	53.0	59 56.6	42.5	235 01.3	12.9	121 19.8	02.1	315 28.0	94	13 00.7	+133
	5	347 48.3	215 59.8	52.2	74 59.9	42.6	250 03.1	12.9	136 22.3	02.1	329 56.4	93	13 14.0	+132
	6	2 50.7	230 59.3	+19 51.4	90 03.2	−27 42.8	265 05.0	+23 12.8	151 24.8	−10 02.0	344 24.7	92	+13 27.2	+132
	7	17 53.2	245 58.7	50.6	105 06.6	42.9	280 06.8	12.8	166 27.3	02.0	358 52.9	91	13 40.4	+131
	8	32 55.6	260 58.2	49.8	120 09.9	43.1	295 08.6	12.8	181 29.8	02.0	13 21.0	91	13 53.5	+129
	9	47 58.1	275 57.7	·· 49.0	135 13.2	·· 43.2	310 10.5	·· 12.8	196 32.3	·· 02.0	27 49.1	89	·14 06.4	+130
	10	63 00.6	290 57.1	48.2	150 16.6	43.4	325 12.3	12.7	211 34.8	02.0	42 17.0	89	14 19.4	+128
	11	78 03.0	305 56.6	47.4	165 19.9	43.5	340 14.2	12.7	226 37.3	02.0	56 44.9	88	14 32.2	+128
	12	93 05.5	320 56.0	+19 46.6	180 23.2	−27 43.7	355 16.0	+23 12.7	241 39.9	−10 02.0	71 12.7	87	+14 45.0	+127
	13	108 08.0	335 55.5	45.8	195 26.6	43.8	10 17.9	12.7	256 42.4	02.0	85 40.4	87	14 57.7	+126
	14	123 10.4	350 55.0	45.0	210 29.9	44.0	25 19.7	12.6	271 44.9	02.0	100 08.1	85	15 10.3	+125
	15	138 12.9	5 54.4	·· 44.2	225 33.2	·· 44.1	40 21.6	·· 12.6	286 47.4	·· 02.0	114 35.6	85	·15 22.8	+124
	16	153 15.4	20 53.9	43.4	240 36.6	44.3	55 23.4	12.6	301 49.9	02.0	129 03.1	84	15 35.2	+124
	17	168 17.8	35 53.3	42.6	255 39.9	44.4	70 25.3	12.5	316 52.4	02.0	143 30.5	82	15 47.6	+122
	18	183 20.3	50 52.8	+19 41.8	270 43.2	−27 44.5	85 27.1	+23 12.5	331 54.9	−10 02.0	157 57.7	82	+15 59.8	+122
	19	198 22.7	65 52.3	41.0	285 46.6	44.7	100 29.0	12.5	346 57.4	02.0	172 24.9	82	16 12.0	+121
	20	213 25.2	80 51.7	40.2	300 49.9	44.8	115 30.8	12.5	1 59.9	02.0	186 52.1	80	16 24.1	+120
	21	228 27.7	95 51.2	·· 39.3	315 53.3	·· 45.0	130 32.7	·· 12.4	17 02.5	·· 02.0	201 19.1	79	·16 36.1	+119
	22	243 30.1	110 50.7	38.5	330 56.6	45.1	145 34.5	12.4	32 05.0	02.0	215 46.0	79	16 48.0	+117
	23	258 32.6	125 50.1	37.7	345 59.9	45.3	160 36.4	12.4	47 07.5	02.0	230 12.9	77	16 59.7	+117
26	0	273 35.1	140 49.6	+19 36.9	1 03.3	−27 45.4	175 38.2	+23 12.4	62 10.0	−10 02.0	244 39.6	77	+17 11.4	+116
	1	288 37.5	155 49.1	36.1	16 06.6	45.5	190 40.1	12.3	77 12.5	02.0	259 06.3	76	17 23.0	+115
	2	303 40.0	170 48.5	35.3	31 09.9	45.7	205 41.9	12.3	92 15.0	01.9	273 32.9	75	17 34.5	+114
	3	318 42.5	185 48.0	·· 34.5	46 13.3	·· 45.8	220 43.7	·· 12.3	107 17.5	·· 01.9	287 59.4	74	·17 45.9	+113
	4	333 44.9	200 47.5	33.6	61 16.6	46.0	235 45.6	12.2	122 20.0	01.9	302 25.8	73	17 57.2	+111
	5	348 47.4	215 46.9	32.8	76 20.0	46.1	250 47.4	12.2	137 22.5	01.9	316 52.1	73	18 08.3	+111
	6	3 49.9	230 46.4	+19 32.0	91 23.3	−27 46.3	265 49.3	+23 12.2	152 25.0	−10 01.9	331 18.4	71	+18 19.4	+110
	7	18 52.3	245 45.9	31.2	106 26.6	46.4	280 51.1	12.2	167 27.5	01.9	345 44.5	71	18 30.4	+108
	8	33 54.8	260 45.4	30.4	121 30.0	46.5	295 53.0	12.1	182 30.1	01.9	0 10.6	69	18 41.2	+107
	9	48 57.2	275 44.8	·· 29.6	136 33.3	·· 46.7	310 54.8	·· 12.1	197 32.6	·· 01.9	14 36.5	69	·18 51.9	+106
	10	63 59.7	290 44.3	28.7	151 36.7	46.8	325 56.7	12.1	212 35.1	01.9	29 02.4	68	19 02.5	+105
	11	79 02.2	305 43.8	27.9	166 40.0	47.0	340 58.5	12.1	227 37.6	01.9	43 28.2	67	19 13.0	+104
	12	94 04.6	320 43.3	+19 27.1	181 43.3	−27 47.1	356 00.4	+23 12.0	242 40.1	−10 01.9	57 53.9	66	+19 23.4	+103
	13	109 07.1	335 42.7	26.3	196 46.7	47.2	11 02.2	12.0	257 42.6	01.9	72 19.5	65	19 33.7	+101
	14	124 09.6	350 42.2	25.4	211 50.0	47.4	26 04.1	12.0	272 45.1	01.9	86 45.0	64	19 43.8	+100
	15	139 12.0	5 41.7	·· 24.6	226 53.3	·· 47.5	41 05.9	·· 11.9	287 47.6	·· 01.9	101 10.4	64	·19 53.8	+ 99
	16	154 14.5	20 41.2	23.8	241 56.7	47.7	56 07.8	11.9	302 50.1	01.9	115 35.8	62	20 03.7	+ 97
	17	169 17.0	35 40.6	23.0	257 00.0	47.8	71 09.6	11.9	317 52.6	01.9	130 01.0	62	20 13.4	+ 97
	18	184 19.4	50 40.1	+19 22.1	272 03.4	−27 47.9	86 11.5	+23 11.9	332 55.1	−10 01.9	144 26.2	61	+20 23.1	+ 95
	19	199 21.9	65 39.6	21.3	287 06.7	48.1	101 13.3	11.8	347 57.6	01.9	158 51.3	60	20 32.6	+ 93
	20	214 24.4	80 39.1	20.5	302 10.0	48.2	116 15.1	11.8	3 00.1	01.9	173 16.3	59	20 41.9	+ 92
	21	229 26.8	95 38.6	·· 19.6	317 13.4	·· 48.3	131 17.0	·· 11.8	18 02.6	·· 01.9	187 41.2	59	·20 51.1	+ 91
	22	244 29.3	110 38.0	18.8	332 16.7	48.5	146 18.8	11.7	33 05.2	01.9	202 06.1	57	21 00.2	+ 90
	23	259 31.7	125 37.5	18.0	347 20.1	48.6	161 20.7	11.7	48 07.7	01.9	216 30.8	57	21 09.2	+ 88
	24	274 34.2	140 37.0	+19 17.1	2 23.4	−27 48.8	176 22.5	+23 11.7	63 10.2	−10 01.9	230 55.5	56	+21 18.0	+ 87
code		—	− 5	− 8	+ 34	− 1	+ 19	0	+ 25	0				

GMT		SUN GHA	SUN Dec.
	h	° ′	° ′
24	0	179 29.1	+23 25.9
	1	194 29.0	25.9
	2	209 28.8	25.8
	3	224 28.7	•• 25.8
	4	239 28.6	25.7
	5	254 28.4	25.7
	6	269 28.3	+23 25.7
	7	284 28.2	25.6
	8	299 28.0	25.6
	9	314 27.9	•• 25.5
	10	329 27.8	25.5
	11	344 27.6	25.5
	12	359 27.5	+23 25.4
	13	14 27.4	25.4
	14	29 27.2	25.3
	15	44 27.1	•• 25.3
	16	59 27.0	25.2
	17	74 26.8	25.2
	18	89 26.7	+23 25.1
	19	104 26.6	25.1
	20	119 26.4	25.0
	21	134 26.3	•• 25.0
	22	149 26.2	24.9
	23	164 26.0	24.9
25	0	179 25.9	+23 24.8
	1	194 25.8	24.8
	2	209 25.6	24.7
	3	224 25.5	•• 24.7
	4	239 25.4	24.6
	5	254 25.2	24.6
	6	269 25.1	+23 24.5
	7	284 25.0	24.5
	8	299 24.8	24.4
	9	314 24.7	•• 24.3
	10	329 24.5	24.3
	11	344 24.4	24.2
	12	359 24.3	+23 24.2
	13	14 24.1	24.1
	14	29 24.0	24.0
	15	44 23.9	•• 24.0
	16	59 23.7	23.9
	17	74 23.6	23.8
	18	89 23.5	+23 23.8
	19	104 23.3	23.7
	20	119 23.2	23.6
	21	134 23.1	•• 23.6
	22	149 22.9	23.5
	23	164 22.8	23.4
26	0	179 22.7	+23 23.4
	1	194 22.5	23.3
	2	209 22.4	23.2
	3	224 22.3	•• 23.2
	4	239 22.1	23.1
	5	254 22.0	23.0
	6	269 21.9	+23 22.9
	7	284 21.7	22.9
	8	299 21.6	22.8
	9	314 21.5	•• 22.7
	10	329 21.3	22.6
	11	344 21.2	22.6
	12	359 21.1	+23 22.5
	13	14 20.9	22.4
	14	29 20.8	22.3
	15	44 20.7	•• 22.2
	16	59 20.6	22.2
	17	74 20.4	22.1
	18	89 20.3	+23 22.0
	19	104 20.2	21.9
	20	119 20.0	21.8
	21	134 19.9	•• 21.8
	22	149 19.8	21.7
	23	164 19.6	21.6
	24	179 19.5	+23 21.5
code		—	− 1

No.	STARS Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 52.1	−40 28.9
5	Achernar	335 59.7	−57 27.7
30	Acrux	173 58.9	−62 51.2
19	Adhara	255 47.7	−28 54.6
10	Aldebaran	291 40.5	+16 25.2
32	Alioth	166 59.2	+56 12.6
34	Alkaid	153 33.3	+49 32.5
55	Al Na'ir	28 38.8	−47 10.6
15	Alnilam	276 31.6	− 1 13.7
25	Alphard	218 39.7	− 8 27.7
41	Alphecca	126 48.1	+26 52.0
1	Alpheratz	358 29.3	+28 50.3
51	Altair	62 51.0	+ 8 44.8
2	Ankaa	353 59.2	−42 32.8
42	Antares	113 20.2	−26 20.1
37	Arcturus	146 35.8	+19 25.1
43	Atria	109 01.2	−68 57.0
22	Avior	234 36.8	−59 21.9
13	Bellatrix	279 19.8	+ 6 18.7
16	Betelg'se	271 49.5	+ 7 24.1
17	Canopus	264 16.3	−52 40.2
12	Capella	281 40.3	+45 57.2
53	Deneb	50 01.3	+45 06.9
28	Denebola	183 18.7	+14 49.6
4	Diphda	349 40.2	−18 13.9
27	Dubhe	194 45.8	+62 00.0
14	Elnath	279 08.9	+28 34.3
47	Eltanin	91 06.1	+51 29.6
54	Enif	34 30.3	+ 9 40.0
56	Fomalhaut	16 12.5	−29 51.6
31	Gacrux	172 50.3	−56 51.9
29	Gienah	176 37.8	−17 17.6
35	Hadar	149 50.5	−60 09.6
6	Hamal	328 50.9	+23 14.9
48	Kaus Aust.	84 42.0	−34 24.5
40	Kochab	137 16.9	+74 20.6
57	Markab	14 22.3	+14 57.6
8	Menkar	315 01.5	+ 3 54.8
36	Menkent	148 59.6	−36 09.1
24	Miapl'dus	221 50.0	−69 32.0
9	Mirfak	309 44.1	+49 42.0
50	Nunki	76 52.7	−26 21.3
52	Peacock	54 28.2	−56 52.8
21	Pollux	244 22.1	+28 08.3
20	Procyon	245 46.3	+ 5 20.6
46	R'alhague	96 47.1	+12 35.5
26	Regulus	208 30.7	+12 11.4
11	Rigel	281 54.9	− 8 15.1
38	Rigil Kent.	140 52.0	−60 39.3
44	Sabik	103 02.9	−15 40.3
3	Schedar	350 31.2	+56 17.1
45	Shaula	97 21.5	−37 04.4
18	Sirius	259 13.0	−16 39.1
33	Spica	159 17.8	−10 55.6
23	Suhail	223 25.4	−43 15.1
49	Vega	81 08.5	+38 44.4
39	Zub'g'bi	137 54.2	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 24	25	26	27
N °	h m	h m	h m	h m	h m	h m
72	▭	▭	22 10	21 13	▭	▭
70	▭	▭	22 29	21 56	▭	▭
68	▭	▭	22 44	22 26	21 50	▭
66	▭	▭	22 56	22 48	22 36	22 02
64	1 32	////	23 07	23 06	23 06	23 12
62	2 10	////	23 16	23 21	23 29	23 48
60	2 37	////	23 24	23 33	23 48	24 14
58	2 57	////	23 31	23 44	24 04	0 04
56	3 14	////	23 37	23 53	24 17	0 17
54	3 28	////	23 42	24 02	0 02	0 28
52	3 41	////	23 47	24 09	0 09	0 39
50	3 52	////	23 51	24 16	0 16	0 48
45	4 14	1 41	24 01	0 01	0 31	1 07
40	4 32	2 29	24 09	0 09	0 43	1 23
35	4 47	3 00	24 16	0 16	0 54	1 37
30	5 00	3 23	24 23	0 23	1 03	1 49
20	5 22	3 58	24 34	0 34	1 19	2 09
10	5 41	4 23	24 43	0 43	1 33	2 27
0	5 59	4 44	0 02	0 52	1 46	2 43
10	6 16	5 01	0 06	1 01	1 59	3 00
20	6 35	5 16	0 12	1 11	2 14	3 18
30	6 56	5 30	0 17	1 23	2 30	3 39
35	7 08	5 37	0 21	1 29	2 40	3 52
40	7 22	5 45	0 25	1 37	2 51	4 06
45	7 39	5 52	0 29	1 46	3 04	4 23
50	8 00	6 00	0 35	1 56	3 20	4 44
52	8 10	6 04	0 37	2 01	3 28	4 54
54	8 21	6 07	0 40	2 07	3 36	5 05
56	8 34	6 12	0 43	2 13	3 46	5 18
58	8 49	6 16	0 47	2 20	3 57	5 33
60 S	9 06	6 20	0 51	2 28	4 09	5 51

Lat.	Sunset	Twlt. ends	Moonset 24	25	26	27
N °	h m	h m	h m	h m	h m	h m
72	▭	▭	14 39	17 27	▭	▭
70	▭	▭	14 22	16 46	▭	▭
68	▭	▭	14 09	16 18	18 51	▭
66	▭	▭	13 59	15 57	18 06	20 43
64	22 32	////	13 50	15 40	17 37	19 36
62	21 54	////	13 42	15 26	17 14	19 01
60	21 28	////	13 36	15 15	16 57	18 35
58	21 07	////	13 30	15 05	16 42	18 15
56	20 51	////	13 25	14 56	16 29	17 59
54	20 36	////	13 21	14 49	16 18	17 45
52	20 24	////	13 17	14 42	16 08	17 32
50	20 13	////	13 13	14 36	16 00	17 21
45	19 51	22 24	13 05	14 23	15 41	16 59
40	19 33	21 36	12 59	14 12	15 26	16 41
35	19 18	21 05	12 53	14 03	15 14	16 25
30	19 05	20 42	12 48	13 54	15 03	16 12
20	18 43	20 07	12 40	13 41	14 44	15 50
10	18 24	19 42	12 32	13 29	14 28	15 30
0	18 06	19 21	12 25	13 17	14 13	15 12
10	17 49	19 04	12 18	13 06	13 58	14 54
20	17 31	18 50	12 11	12 54	13 42	14 35
30	17 09	18 35	12 03	12 41	13 23	14 12
35	16 57	18 28	11 58	12 33	13 13	13 59
40	16 42	18 20	11 52	12 24	13 00	13 45
45	16 26	18 13	11 46	12 14	12 46	13 27
50	16 05	18 05	11 39	12 01	12 29	13 05
52	15 55	18 01	11 35	11 55	12 21	12 54
54	15 44	17 58	11 31	11 49	12 11	12 43
56	15 32	17 54	11 27	11 42	12 01	12 29
58	15 17	17 50	11 23	11 34	11 50	12 14
60 S	14 59	17 45	11 17	11 25	11 36	11 55

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.1	0.1	0.3
30			
	0.1	0.1	0.3
45			
	0.1	0.1	0.2
60			
	0.1	0.0	0.1
75			
	0.1	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	24	25	26
°	′	′	′
0			
	18.5	19.0	19.2
4			
	18.5	19.0	19.2
8			
	18.4	18.9	19.2
12			
	18.4	18.9	19.2
16			
	18.4	18.9	19.1
20			
	18.3	18.8	19.0
24			
	18.2	18.7	18.9
28			
	18.2	18.6	18.8
32			
	18.1	18.5	18.7
36			
	18.0	18.4	18.6
40			
	17.9	18.3	18.5
44			
	17.8	18.2	18.4
48			
	17.7	18.0	18.2
52			
	17.5	17.9	18.0
56			
	17.4	17.7	17.9
60			
	17.3	17.6	17.7
64			
	17.1	17.4	17.5
68			
	17.0	17.2	17.3
72			
	16.8	17.0	17.1
76			
	16.7	16.8	16.9
80			
	16.5	16.7	16.7
84			
	16.3	16.5	16.5
88			
	16.2	16.3	16.4
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	24	25	26
°	′	′	′
0			
	13.9	13.6	13.4
4			
	13.9	13.6	13.5
8			
	13.9	13.6	13.5
12			
	13.9	13.7	13.5
16			
	14.0	13.7	13.6
20			
	14.0	13.8	13.7
24			
	14.1	13.9	13.7
28			
	14.2	13.9	13.8
32			
	14.3	14.0	13.9
36			
	14.4	14.2	14.1
40			
	14.5	14.3	14.2
44			
	14.6	14.4	14.3
48			
	14.7	14.5	14.5
52			
	14.8	14.7	14.6
56			
	15.0	14.9	14.8
60			
	15.1	15.0	15.0
64			
	15.2	15.2	15.2
68			
	15.4	15.4	15.3
72			
	15.5	15.5	15.5
76			
	15.7	15.7	15.7
80			
	15.9	15.9	15.9
84			
	16.0	16.1	16.1
88			
	16.1	16.2	16.3
90			

Subtract from table, back cover

Equation of Time (App.—Mean)

GMT	24	25	26
h	m s	m s	m s
0	− 2 03.3	− 2 16.2	− 2 29.0
6	− 2 06.5	− 2 19.4	− 2 32.2
12	− 2 09.7	− 2 22.6	− 2 35.4
18	− 2 13.0	− 2 25.8	− 2 38.6
24	− 2 16.2	− 2 29.0	− 2 41.8

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
24	6 13	14 36	0 06	12 22	19 56
25	7 05	14 36	{0 01 / 23 56}	12 19	19 52
26	7 59	14 37	23 51	12 16	19 48
27	8 58	14 38	23 45	12 13	19 44

GMT	♈ GHA	VENUS −3.4 GHA	VENUS Dec.	MARS −2.3 GHA	MARS Dec.	JUPITER −1.4 GHA	JUPITER Dec.	SATURN 0.7 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
27 0	274 34.2	140 37.0	+19 17.1	2 23.4	−27 48.8	176 22.5	+23 11.7	63 10.2	−10 01.9	230 55.5	56	+21 18.0	+87
1	289 36.7	155 36.5	16.3	17 26.7	48.9	191 24.4	11.7	78 12.7	01.9	245 20.1	55	21 26.7	+86
2	304 39.1	170 36.0	15.5	32 30.1	49.0	206 26.2	11.6	93 15.2	01.9	259 44.6	54	21 35.3	+83
3	319 41.6	185 35.5	·· 14.6	47 33.4	·· 49.2	221 28.1	·· 11.6	108 17.7	·· 01.9	274 09.0	53	·21 43.6	+83
4	334 44.1	200 34.9	13.8	62 36.8	49.3	236 29.9	11.6	123 20.2	01.8	288 33.3	53	21 51.9	+81
5	349 46.5	215 34.4	13.0	77 40.1	49.4	251 31.8	11.5	138 22.7	01.8	302 57.6	52	22 00.0	+80
6	4 49.0	230 33.9	+19 12.1	92 43.4	−27 49.6	266 33.6	+23 11.5	153 25.2	−10 01.8	317 21.8	51	+22 08.0	+78
7	19 51.5	245 33.4	11.3	107 46.8	49.7	281 35.5	11.5	168 27.7	01.8	331 45.9	50	22 15.8	+77
8	34 53.9	260 32.9	10.4	122 50.1	49.8	296 37.3	11.5	183 30.2	01.8	346 09.9	50	22 23.5	+75
9	49 56.4	275 32.4	·· 09.6	137 53.5	·· 50.0	311 39.2	·· 11.4	198 32.7	·· 01.8	0 33.9	49	·22 31.0	+73
10	64 58.9	290 31.9	08.8	152 56.8	50.1	326 41.0	11.4	213 35.2	01.8	14 57.8	48	22 38.3	+72
11	80 01.3	305 31.4	07.9	168 00.1	50.2	341 42.9	11.4	228 37.7	01.8	29 21.6	48	22 45.5	+71
12	95 03.8	320 30.8	+19 07.1	183 03.5	−27 50.4	356 44.7	+23 11.3	243 40.2	−10 01.8	43 45.4	47	+22 52.6	+69
13	110 06.2	335 30.3	06.2	198 06.8	50.5	11 46.6	11.3	258 42.7	01.8	58 09.1	46	22 59.5	+67
14	125 08.7	350 29.8	05.4	213 10.2	50.6	26 48.4	11.3	273 45.2	01.8	72 32.7	45	23 06.2	+66
15	140 11.2	5 29.3	·· 04.5	228 13.5	·· 50.8	41 50.2	·· 11.3	288 47.7	·· 01.8	86 56.2	45	·23 12.8	+64
16	155 13.6	20 28.8	03.7	243 16.9	50.9	56 52.1	11.2	303 50.2	01.8	101 19.7	45	23 19.2	+63
17	170 16.1	35 28.3	02.8	258 20.2	51.0	71 53.9	11.2	318 52.7	01.8	115 43.2	43	23 25.5	+61
18	185 18.6	50 27.8	+19 02.0	273 23.5	−27 51.2	86 55.8	+23 11.2	333 55.2	−10 01.8	130 06.5	43	+23 31.6	+59
19	200 21.0	65 27.3	01.1	288 26.9	51.3	101 57.6	11.1	348 57.7	01.8	144 29.8	43	23 37.5	+58
20	215 23.5	80 26.8	19 00.3	303 30.2	51.4	116 59.5	11.1	4 00.2	01.8	158 53.1	42	23 43.3	+56
21	230 26.0	95 26.3	·18 59.4	318 33.6	·· 51.6	132 01.3	·· 11.1	19 02.7	·· 01.8	173 16.3	41	·23 48.9	+54
22	245 28.4	110 25.8	58.6	333 36.9	51.7	147 03.2	11.1	34 05.2	01.8	187 39.4	41	23 54.3	+53
23	260 30.9	125 25.3	57.7	348 40.2	51.8	162 05.0	11.0	49 07.7	01.8	202 02.5	40	23 59.6	+51
28 0	275 33.4	140 24.8	+18 56.9	3 43.6	−27 52.0	177 06.9	+23 11.0	64 10.3	−10 01.8	216 25.5	40	+24 04.7	+50
1	290 35.8	155 24.3	56.0	18 46.9	52.1	192 08.7	11.0	79 12.8	01.8	230 48.5	40	24 09.7	+47
2	305 38.3	170 23.8	55.2	33 50.3	52.2	207 10.6	10.9	94 15.3	01.8	245 11.5	39	24 14.4	+46
3	320 40.7	185 23.3	·· 54.3	48 53.6	·· 52.3	222 12.4	·· 10.9	109 17.8	·· 01.8	259 34.4	38	·24 19.0	+44
4	335 43.2	200 22.8	53.5	63 56.9	52.5	237 14.3	10.9	124 20.3	01.8	273 57.2	39	24 23.4	+43
5	350 45.7	215 22.3	52.6	79 00.3	52.6	252 16.1	10.9	139 22.8	01.8	288 20.1	37	24 27.7	+41
6	5 48.1	230 21.8	+18 51.7	94 03.6	−27 52.7	267 18.0	+23 10.8	154 25.3	−10 01.8	302 42.8	38	+24 31.8	+39
7	20 50.6	245 21.3	50.9	109 07.0	52.9	282 19.8	10.8	169 27.8	01.8	317 05.6	37	24 35.7	+37
8	35 53.1	260 20.8	50.0	124 10.3	53.0	297 21.6	10.8	184 30.3	01.8	331 28.3	37	24 39.4	+36
9	50 55.5	275 20.3	·· 49.2	139 13.6	·· 53.1	312 23.5	·· 10.7	199 32.8	·· 01.8	345 51.0	36	·24 43.0	+33
10	65 58.0	290 19.8	48.3	154 17.0	53.2	327 25.3	10.7	214 35.3	01.8	0 13.6	37	24 46.3	+32
11	81 00.5	305 19.3	47.4	169 20.3	53.4	342 27.2	10.7	229 37.8	01.8	14 36.3	36	24 49.5	+31
12	96 02.9	320 18.8	+18 46.6	184 23.7	−27 53.5	357 29.0	+23 10.6	244 40.3	−10 01.8	28 58.9	35	+24 52.6	+28
13	111 05.4	335 18.3	45.7	199 27.0	53.6	12 30.9	10.6	259 42.8	01.8	43 21.4	36	24 55.4	+27
14	126 07.8	350 17.8	44.8	214 30.3	53.7	27 32.7	10.6	274 45.3	01.8	57 44.0	35	24 58.1	+25
15	141 10.3	5 17.3	·· 44.0	229 33.7	·· 53.9	42 34.6	·· 10.6	289 47.8	·· 01.8	72 06.5	36	·25 00.6	+23
16	156 12.8	20 16.8	43.1	244 37.0	54.0	57 36.4	10.5	304 50.3	01.8	86 29.1	35	25 02.9	+21
17	171 15.2	35 16.4	42.2	259 40.3	54.1	72 38.3	10.5	319 52.8	01.8	100 51.6	35	25 05.0	+20
18	186 17.7	50 15.9	+18 41.4	274 43.7	−27 54.2	87 40.1	+23 10.5	334 55.3	−10 01.8	115 14.1	35	+25 07.0	+18
19	201 20.2	65 15.4	40.5	289 47.0	54.4	102 42.0	10.4	349 57.8	01.8	129 36.6	35	25 08.8	+16
20	216 22.6	80 14.9	39.6	304 50.4	54.5	117 43.8	10.4	5 00.3	01.8	143 59.1	34	25 10.4	+14
21	231 25.1	95 14.4	·· 38.8	319 53.7	·· 54.6	132 45.7	·· 10.4	20 02.8	·· 01.8	158 21.5	35	·25 11.8	+12
22	246 27.6	110 13.9	37.9	334 57.0	54.7	147 47.5	10.3	35 05.2	01.8	172 44.0	35	25 13.0	+11
23	261 30.0	125 13.4	37.0	350 00.4	54.9	162 49.4	10.3	50 07.7	01.8	187 06.5	35	25 14.1	+8
29 0	276 32.5	140 12.9	+18 36.2	5 03.7	−27 55.0	177 51.2	+23 10.3	65 10.2	−10 01.8	201 29.0	35	+25 14.9	+7
1	291 35.0	155 12.4	35.3	20 07.1	55.1	192 53.1	10.3	80 12.7	01.8	215 51.5	35	25 15.6	+6
2	306 37.4	170 12.0	34.4	35 10.4	55.2	207 54.9	10.2	95 15.2	01.8	230 14.0	35	25 16.2	+3
3	321 39.9	185 11.5	·· 33.5	50 13.7	·· 55.4	222 56.7	·· 10.2	110 17.7	·· 01.8	244 36.5	35	·25 16.5	+2
4	336 42.3	200 11.0	32.7	65 17.1	55.5	237 58.6	10.2	125 20.2	01.8	258 59.0	36	25 16.7	−1
5	351 44.8	215 10.5	31.8	80 20.4	55.6	253 00.4	10.1	140 22.7	01.8	273 21.6	36	25 16.6	−2
6	6 47.3	230 10.0	+18 30.9	95 23.7	−27 55.7	268 02.3	+23 10.1	155 25.2	−10 01.8	287 44.2	36	+25 16.4	−3
7	21 49.7	245 09.5	30.0	110 27.1	55.8	283 04.1	10.1	170 27.7	01.8	302 06.8	36	25 16.1	−6
8	36 52.2	260 09.1	29.1	125 30.4	56.0	298 06.0	10.0	185 30.2	01.8	316 29.4	36	25 15.5	−7
9	51 54.7	275 08.6	·· 28.3	140 33.7	·· 56.1	313 07.8	·· 10.0	200 32.7	·· 01.8	330 52.0	37	·25 14.8	−9
10	66 57.1	290 08.1	27.4	155 37.1	56.2	328 09.7	10.0	215 35.2	01.8	345 14.7	37	25 13.9	−11
11	81 59.6	305 07.6	26.5	170 40.4	56.3	343 11.5	10.0	230 37.7	01.8	359 37.4	37	25 12.8	−13
12	97 02.1	320 07.2	+18 25.6	185 43.8	−27 56.4	358 13.4	+23 09.9	245 40.2	−10 01.8	14 00.1	38	+25 11.5	−14
13	112 04.5	335 06.7	24.7	200 47.1	56.6	13 15.2	09.9	260 42.7	01.8	28 22.9	38	25 10.1	−16
14	127 07.0	350 06.2	23.8	215 50.4	56.7	28 17.1	09.9	275 45.2	01.8	42 45.7	38	25 08.5	−18
15	142 09.5	5 05.7	·· 23.0	230 53.8	·· 56.8	43 18.9	·· 09.8	290 47.7	·· 01.8	57 08.5	39	·25 06.7	−20
16	157 11.9	20 05.2	22.1	245 57.1	56.9	58 20.8	09.8	305 50.2	01.8	71 31.4	39	25 04.7	−21
17	172 14.4	35 04.8	21.2	261 00.4	57.0	73 22.6	09.8	320 52.7	01.8	85 54.3	40	25 02.6	−23
18	187 16.8	50 04.3	+18 20.3	276 03.8	−27 57.2	88 24.5	+23 09.7	335 55.2	−10 01.8	100 17.3	41	+25 00.3	−25
19	202 19.3	65 03.8	19.4	291 07.1	57.3	103 26.3	09.7	350 57.7	01.8	114 40.4	40	24 57.8	−27
20	217 21.8	80 03.4	18.5	306 10.4	57.4	118 28.2	09.7	6 00.2	01.8	129 03.4	42	24 55.1	−28
21	232 24.2	95 02.9	·· 17.6	321 13.8	·· 57.5	133 30.0	·· 09.6	21 02.7	·· 01.8	143 26.6	42	·24 52.3	−30
22	247 26.7	110 02.4	16.7	336 17.1	57.6	148 31.8	09.6	36 05.2	01.8	157 49.8	42	24 49.3	−31
23	262 29.2	125 01.9	15.8	351 20.4	57.8	163 33.7	09.6	51 07.7	01.8	172 13.0	43	24 46.2	−34
24	277 31.6	140 01.5	+18 15.0	6 23.8	−27 57.9	178 35.5	+23 09.6	66 10.1	−10 01.8	186 36.3	44	+24 42.8	−35
code	—	−5	−9	+33	−1	+19	0	+25	0				

G M T	SUN GHA	SUN Dec.
h	° ′	° ′
27 0	179 19.5	+23 21.5
1	194 19.4	21.4
2	209 19.2	21.3
3	224 19.1	·· 21.2
4	239 19.0	21.1
5	254 18.8	21.1
6	269 18.7	+23 21.0
7	284 18.6	20.9
8	299 18.4	20.8
9	314 18.3	·· 20.7
10	329 18.2	20.6
11	344 18.0	20.5
12	359 17.9	+23 20.4
13	14 17.8	20.3
14	29 17.7	20.2
15	44 17.5	·· 20.1
16	59 17.4	20.0
17	74 17.3	19.9
18	89 17.1	+23 19.8
19	104 17.0	19.7
20	119 16.9	19.6
21	134 16.7	·· 19.5
22	149 16.6	19.4
23	164 16.5	19.3
28 0	179 16.3	+23 19.2
1	194 16.2	19.1
2	209 16.1	19.0
3	224 16.0	·· 18.9
4	239 15.8	18.8
5	254 15.7	18.7
6	269 15.6	+23 18.6
7	284 15.4	18.5
8	299 15.3	18.4
9	314 15.2	·· 18.2
10	329 15.0	18.1
11	344 14.9	18.0
12	359 14.8	+23 17.9
13	14 14.7	17.8
14	29 14.5	17.7
15	44 14.4	·· 17.6
16	59 14.3	17.5
17	74 14.1	17.3
18	89 14.0	+23 17.2
19	104 13.9	17.1
20	119 13.8	17.0
21	134 13.6	·· 16.9
22	149 13.5	16.7
23	164 13.4	16.6
29 0	179 13.2	+23 16.5
1	194 13.1	16.4
2	209 13.0	16.3
3	224 12.9	·· 16.1
4	239 12.7	16.0
5	254 12.6	15.9
6	269 12.5	+23 15.8
7	284 12.3	15.6
8	299 12.2	15.5
9	314 12.1	·· 15.4
10	329 12.0	15.3
11	344 11.8	15.1
12	359 11.7	+23 15.0
13	14 11.6	14.9
14	29 11.4	14.7
15	44 11.3	·· 14.6
16	59 11.2	14.5
17	74 11.1	14.3
18	89 10.9	+23 14.2
19	104 10.8	14.1
20	119 10.7	13.9
21	134 10.6	·· 13.8
22	149 10.4	13.7
23	164 10.3	13.5
24	179 10.2	+23 13.4
code	—	−1

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 52.0	−40 28.9
5	Achernar	335 59.6	−57 27.6
30	Acrux	173 59.0	−62 51.2
19	Adhara	255 47.7	−28 54.5
10	Aldebaran	291 40.4	+16 25.2
32	Alioth	166 59.2	+56 12.6
34	Alkaid	153 33.4	+49 32.5
55	Al Na'ir	28 38.8	−47 10.6
15	Alnilam	276 31.5	− 1 13.7
25	Alphard	218 39.7	− 8 27.7
41	Alphecca	126 48.1	+26 52.0
1	Alpheratz	358 29.3	+28 50.3
51	Altair	62 51.0	+ 8 44.8
2	Ankaa	353 59.1	−42 32.8
42	Antares	113 20.2	−26 20.1
37	Arcturus	146 35.8	+19 25.1
43	Atria	109 01.2	−68 57.0
22	Avior	234 36.8	−59 21.9
13	Bellatrix	279 19.7	+ 6 18.7
16	Betelg'se	271 49.5	+ 7 24.1
17	Canopus	264 16.3	−52 40.2
12	Capella	281 40.3	+45 57.2
53	Deneb	50 01.3	+45 06.9
28	Denebola	183 18.7	+14 49.6
4	Diphda	349 40.2	−18 13.9
27	Dubhe	194 45.9	+62 00.0
14	Elnath	279 08.9	+28 34.3
47	Eltanin	91 06.1	+51 29.6
54	Enif	34 30.3	+ 9 40.0
56	Fomalhaut	16 12.4	−29 51.6
31	Gacrux	172 50.3	−56 51.9
29	Gienah	176 37.8	−17 17.6
35	Hadar	149 50.5	−60 09.6
6	Hamal	328 50.9	+23 14.9
48	Kaus Aust.	84 42.0	−34 24.5
40	Kochab	137 17.0	+74 20.7
57	Markab	14 22.3	+14 57.6
8	Menkar	315 01.5	+ 3 54.8
36	Menkent	148 59.6	−36 09.1
24	Miapl'dus	221 50.1	−69 32.0
9	Mirfak	309 44.1	+49 42.0
50	Nunki	76 52.7	−26 21.3
52	Peacock	54 28.1	−56 52.8
21	Pollux	244 22.1	+28 08.3
20	Procyon	245 46.3	+ 5 20.6
46	R'alhague	96 47.1	+12 35.5
26	Regulus	208 30.7	+12 11.4
11	Rigel	281 54.9	− 8 15.1
38	Rigil Kent.	140 52.0	−60 39.3
44	Sabik	103 02.9	−15 40.3
3	Schedar	350 31.2	+56 17.1
45	Shaula	97 21.5	−37 04.4
18	Sirius	259 13.0	−16 39.1
33	Spica	159 17.8	−10 55.6
23	Suhail	223 25.4	−43 15.1
49	Vega	81 08.5	+38 44.4
39	Zub'g'bi	137 54.2	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 27	Moonrise 28	Moonrise 29	Moonrise 30
N °	h m	h m	h m	h m	h m	h m
72	□	□	□	□	□	□
70	□	□	□	□	□	□
68	□	□	□	□	□	□
66	□	□	22 02	□	□	□
64	1 35	////	23 12	23 38	24 59	0 59
62	2 13	////	23 48	24 28	0 28	1 43
60	2 39	////	24 14	0 14	1 00	2 12
58	2 59	////	0 04	0 35	1 23	2 34
56	3 16	////	0 17	0 51	1 42	2 52
54	3 30	////	0 28	1 06	1 58	3 07
52	3 42	////	0 39	1 19	2 12	3 20
50	3 53	////	0 48	1 30	2 24	3 32
45	4 15	1 43	1 07	1 53	2 50	3 56
40	4 33	2 30	1 23	2 12	3 10	4 15
35	4 48	3 01	1 37	2 28	3 26	4 31
30	5 01	3 25	1 49	2 41	3 41	4 45
20	5 23	3 59	2 09	3 05	4 05	5 09
10	5 42	4 24	2 27	3 25	4 27	5 29
0	5 59	4 44	2 43	3 44	4 47	5 48
10	6 17	5 02	3 00	4 03	5 07	6 07
20	6 35	5 16	3 18	4 24	5 28	6 28
30	6 56	5 31	3 39	4 48	5 53	6 51
35	7 09	5 38	3 52	5 02	6 08	7 05
40	7 23	5 45	4 06	5 18	6 24	7 21
45	7 39	5 53	4 23	5 38	6 45	7 40
50	8 00	6 01	4 44	6 02	7 10	8 04
52	8 10	6 04	4 54	6 14	7 23	8 15
54	8 21	6 08	5 05	6 28	7 37	8 28
56	8 34	6 12	5 18	6 43	7 53	8 43
58	8 48	6 15	5 33	7 02	8 13	9 00
60	9 06	6 20	5 51	7 25	8 37	9 21
S						

Lat.	Sunset	Twlt. ends	Moonset 27	Moonset 28	Moonset 29	Moonset 30
N °	h m	h m	h m	h m	h m	h m
72	□	□	□	□	□	□
70	□	□	□	□	□	□
68	□	□	□	□	□	□
66	□	□	20 43	□	□	23 04
64	22 30	////	19 36	21 21	22 10	22 22
62	21 53	////	19 01	20 31	21 27	21 53
60	21 27	////	18 35	20 00	20 58	21 31
58	21 07	////	18 15	19 36	20 35	21 13
56	20 50	////	17 59	19 17	20 17	20 58
54	20 36	////	17 45	19 01	20 01	20 45
52	20 24	////	17 32	18 47	19 48	20 33
50	20 13	////	17 21	18 35	19 36	20 23
45	19 51	22 23	16 59	18 10	19 12	20 01
40	19 33	21 36	16 41	17 50	18 52	19 44
35	19 18	21 05	16 25	17 34	18 36	19 29
30	19 05	20 41	16 12	17 19	18 21	19 16
20	18 43	20 07	15 50	16 55	17 57	18 54
10	18 24	19 42	15 30	16 34	17 36	18 35
0	18 07	19 22	15 12	16 14	17 16	18 17
10	17 50	19 05	14 54	15 54	16 57	17 59
20	17 31	18 50	14 35	15 33	16 35	17 39
30	17 10	18 35	14 12	15 09	16 11	17 17
35	16 58	18 29	13 59	14 54	15 56	17 03
40	16 43	18 21	13 45	14 38	15 40	16 48
45	16 27	18 14	13 27	14 18	15 19	16 30
50	16 06	18 05	13 05	13 53	14 54	16 07
52	15 57	18 03	12 54	13 41	14 42	15 56
54	15 46	17 59	12 43	13 27	14 28	15 43
56	15 33	17 55	12 29	13 11	14 11	15 29
58	15 18	17 50	12 14	12 52	13 52	15 12
60	15 01	17 47	11 55	12 29	13 27	14 51
S						

G M T	Equation of Time (App.—Mean) 27	28	29
h	m s	m s	m s
0	− 2 41.8	− 2 54.3	− 3 06.8
6	− 2 44.9	− 2 57.5	− 3 09.9
12	− 2 48.1	− 3 00.6	− 3 12.9
18	− 2 51.2	− 3 03.7	− 3 16.0
24	− 2 54.3	− 3 06.8	− 3 19.0

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
27	8 58	14 38	23 45	12 13	19 44
28	9 59	14 39	23 40	12 10	19 40
29	11 02	14 40	23 35	12 07	19 36
30	12 03	14 40	23 29	12 04	19 32

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.1	0.1	0.3
30			
	0.1	0.1	0.3
45			
	0.1	0.1	0.2
60			
	0.1	0.0	0.1
75			
	0.1	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	27	28	29
°	′	′	′
0			
	19.4	19.1	18.7
4			
	19.4	19.1	18.7
8			
	19.3	19.1	18.7
12			
	19.3	19.0	18.7
16			
	19.2	19.0	18.6
20			
	19.2	18.9	18.6
24			
	19.1	18.8	18.5
28			
	19.0	18.7	18.4
32			
	18.9	18.6	18.3
36			
	18.7	18.5	18.2
40			
	18.6	18.4	18.1
44			
	18.5	18.3	18.0
48			
	18.3	18.1	17.8
52			
	18.1	18.0	17.7
56			
	18.0	17.8	17.6
60			
	17.8	17.6	17.4
64			
	17.6	17.5	17.2
68			
	17.4	17.3	17.1
72			
	17.2	17.1	16.9
76			
	17.0	16.9	16.8
80			
	16.8	16.7	16.6
84			
	16.6	16.5	16.4
88			
	16.4	16.4	16.3
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	27	28	29
°	′	′	′
0			
	13.4	13.5	13.7
4			
	13.4	13.5	13.7
8			
	13.4	13.6	13.8
12			
	13.5	13.6	13.8
16			
	13.5	13.6	13.9
20			
	13.6	13.7	13.9
24			
	13.7	13.8	14.0
28			
	13.8	13.9	14.1
32			
	13.9	14.0	14.2
36			
	14.0	14.1	14.3
40			
	14.1	14.2	14.4
44			
	14.3	14.4	14.5
48			
	14.4	14.5	14.6
52			
	14.6	14.7	14.8
56			
	14.8	14.8	14.9
60			
	15.0	15.0	15.1
64			
	15.1	15.2	15.2
68			
	15.3	15.4	15.4
72			
	15.5	15.5	15.5
76			
	15.7	15.7	15.7
80			
	15.9	15.9	15.9
84			
	16.2	16.1	16.1
88			
	16.3	16.3	16.2
90			

Subtract from table, back cover

GMT		♈ GHA	VENUS −3.5 GHA	VENUS Dec.	MARS −2.2 GHA	MARS Dec.	JUPITER −1.4 GHA	JUPITER Dec.	SATURN 0.7 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
30	0	277 31.6	140 01.5	+18 15.0	6 23.8	−27 57.9	178 35.5	+23 09.6	66 10.1	−10 01.8	186 36.3	44	+24 42.8	−35
	1	292 34.1	155 01.0	14.1	21 27.1	58.0	193 37.4	09.5	81 12.6	01.8	200 59.7	44	24 39.3	−36
	2	307 36.6	170 00.5	13.2	36 30.4	58.1	208 39.2	09.5	96 15.1	01.8	215 23.1	45	24 35.7	−39
	3	322 39.0	185 00.1	·· 12.3	51 33.8	·· 58.2	223 41.1	·· 09.5	111 17.6	·· 01.8	229 46.6	46	·24 31.8	−40
	4	337 41.5	199 59.6	11.4	66 37.1	58.3	238 42.9	09.4	126 20.1	01.8	244 10.2	47	24 27.8	−41
	5	352 44.0	214 59.1	10.5	81 40.4	58.4	253 44.8	09.4	141 22.6	01.8	258 33.9	47	24 23.7	−43
	6	7 46.4	229 58.7	+18 09.6	96 43.8	−27 58.6	268 46.6	+23 09.4	156 25.1	−10 01.8	272 57.6	48	+24 19.4	−45
	7	22 48.9	244 58.2	08.7	111 47.1	58.7	283 48.5	09.3	171 27.6	01.8	287 21.4	48	24 14.9	−46
	8	37 51.3	259 57.7	07.8	126 50.4	58.8	298 50.3	09.3	186 30.1	01.8	301 45.2	50	24 10.3	−48
	9	52 53.8	274 57.3	·· 06.9	141 53.8	·· 58.9	313 52.2	·· 09.3	201 32.6	·· 01.8	316 09.2	50	·24 05.5	−50
	10	67 56.3	289 56.8	06.0	156 57.1	59.0	328 54.0	09.2	216 35.1	01.8	330 33.2	51	24 00.5	−51
	11	82 58.7	304 56.3	05.1	172 00.4	59.1	343 55.9	09.2	231 37.6	01.8				
	12	98 01.2	319 55.9	+18 04.2	187 03.7	−27 59.2	358 57.7	+23 09.2	246 40.1	−10 01.8				
	13	113 03.7	334 55.4	03.3	202 07.1	59.4	13 59.6	09.1	261 42.6	01.8				
	14	128 06.1	349 54.9	02.4	217 10.4	59.5	29 01.4	09.1	276 45.0	01.8				
	15	143 08.6	4 54.5	·· 01.5	232 13.7	·· 59.6	44 03.3	·· 09.1	291 47.5	·· 01.8	42 34.5	55	·23 33.5	−59
	16	158 11.1	19 54.0	18 00.6	247 17.1	59.7	59 05.1	09.1	306 50.0	01.8	56 59.0	57	23 27.6	−60
	17	173 13.5	34 53.6	17 59.7	262 20.4	59.8	74 06.9	09.0	321 52.5	01.8	71 23.7	57	23 21.6	−62
	18	188 16.0	49 53.1	+17 58.8	277 23.7	−27 59.9	89 08.8	+23 09.0	336 55.0	−10 01.8	85 48.4	58	+23 15.4	−63
	19	203 18.4	64 52.7	57.8	292 27.1	28 00.0	104 10.6	09.0	351 57.5	01.8	100 13.2	58	23 09.1	−64
	20	218 20.9	79 52.2	56.9	307 30.4	00.1	119 12.5	08.9	7 00.0	01.8	114 38.0	60	23 02.7	−66
	21	233 23.4	94 51.7	·· 56.0	322 33.7	·· 00.2	134 14.3	·· 08.9	22 02.5	·· 01.8	129 03.0	61	·22 56.1	−67
	22	248 25.8	109 51.3	55.1	337 37.0	00.4	149 16.2	08.9	37 05.0	01.8	143 28.1	62	22 49.4	−69
	23	263 28.3	124 50.8	54.2	352 40.4	00.5	164 18.0	08.8	52 07.5	01.8	157 53.3	63	22 42.5	−70
1	0	278 30.8	139 50.4	+17 53.3	7 43.7	−28 00.6	179 19.9	+23 08.8	67 10.0	−10 01.8	172 18.6	63	+22 35.5	−72
	1	293 33.2	154 49.9	52.4	22 47.0	00.7	194 21.7	08.8	82 12.4	01.8	186 43.9	65	22 28.3	−72
	2	308 35.7	169 49.5	51.5	37 50.3	00.8	209 23.6	08.7	97 14.9	01.8	201 09.4	66	22 21.1	−74
	3	323 38.2	184 49.0	·· 50.6	52 53.7	·· 00.9	224 25.4	·· 08.7	112 17.4	·· 01.8	215 35.0	66	·22 13.7	−76
	4	338 40.6	199 48.6	49.6	67 57.0	01.0	239 27.3	08.7	127 19.9	01.8	230 00.6	68	22 06.1	−76
	5	353 43.1	214 48.1	48.7	83 00.3	01.1	254 29.1	08.6	142 22.4	01.8	244 26.4	69	21 58.5	−78
	6	8 45.6	229 47.7	+17 47.8	98 03.6	−28 01.2	269 31.0	+23 08.6	157 24.9	−10 01.8	258 52.3	69	+21 50.7	−80
	7	23 48.0	244 47.2	46.9	113 07.0	01.3	284 32.8	08.6	172 27.4	01.8	273 18.2	71	21 42.7	−80
	8	38 50.5	259 46.8	46.0	128 10.3	01.4	299 34.7	08.5	187 29.9	01.8	287 44.3	72	21 34.7	−82
	9	53 52.9	274 46.3	·· 45.1	143 13.6	·· 01.5	314 36.5	·· 08.5	202 32.4	·· 01.8	302 10.5	73	·21 26.5	−83
	10	68 55.4	289 45.9	44.1	158 16.9	01.7	329 38.4	08.5	217 34.8	01.8	316 36.8	74	21 18.2	−84
	11	83 57.9	304 45.4	43.2	173 20.2	01.8	344 40.2	08.4	232 37.3	01.9	331 03.2	75	21 09.8	−85
	12	99 00.3	319 45.0	+17 42.3	188 23.6	−28 01.9	359 42.1	+23 08.4	247 39.8	−10 01.9	345 29.7	76	+21 01.3	−87
	13	114 02.8	334 44.5	41.4	203 26.9	02.0	14 43.9	08.4	262 42.3	01.9	359 56.3	77	20 52.6	−87
	14	129 05.3	349 44.1	40.5	218 30.2	02.1	29 45.7	08.3	277 44.8	01.9	14 23.0	78	20 43.9	−89
	15	144 07.7	4 43.6	·· 39.5	233 33.5	·· 02.2	44 47.6	·· 08.3	292 47.3	·· 01.9	28 49.8	80	·20 35.0	−90
	16	159 10.2	19 43.2	38.6	248 36.9	02.3	59 49.4	08.3	307 49.8	01.9	43 16.8	80	20 26.0	−91
	17	174 12.7	34 42.7	37.7	263 40.2	02.4	74 51.3	08.2	322 52.3	01.9	57 43.8	81	20 16.9	−92
	18	189 15.1	49 42.3	+17 36.8	278 43.5	−28 02.5	89 53.1	+23 08.2	337 54.8	−10 01.9	72 10.9	83	+20 07.7	−93
	19	204 17.6	64 41.9	35.8	293 46.8	02.6	104 55.0	08.2	352 57.2	01.9	86 38.2	83	19 58.4	−94
	20	219 20.1	79 41.4	34.9	308 50.1	02.7	119 56.8	08.1	7 59.7	01.9	101 05.5	85	19 49.0	−95
	21	234 22.5	94 41.0	·· 34.0	323 53.4	·· 02.8	134 58.7	·· 08.1	23 02.2	·· 01.9	115 33.0	86	·19 39.5	−97
	22	249 25.0	109 40.5	33.1	338 56.8	02.9	150 00.5	08.1	38 04.7	01.9	130 00.6	86	19 29.8	−97
	23	264 27.4	124 40.1	32.1	354 00.1	03.0	165 02.4	08.0	53 07.2	01.9	144 28.2	88	19 20.1	−98
2	0	279 29.9	139 39.7	+17 31.2	9 03.4	−28 03.1	180 04.2	+23 08.0	68 09.7	−10 01.9	158 56.0	89	+19 10.3	−99
	1	294 32.4	154 39.2	30.3	24 06.7	03.2	195 06.1	08.0	83 12.2	01.9	173 23.9	90	19 00.4	−100
	2	309 34.8	169 38.8	29.3	39 10.0	03.3	210 07.9	07.9	98 14.6	01.9	187 51.9	91	18 50.4	−102
	3	324 37.3	184 38.3	·· 28.4	54 13.3	·· 03.4	225 09.8	·· 07.9	113 17.1	·· 01.9	202 20.0	93	·18 40.2	−102
	4	339 39.8	199 37.9	27.5	69 16.7	03.5	240 11.6	07.9	128 19.6	01.9	216 48.3	93	18 30.0	−103
	5	354 42.2	214 37.5	26.5	84 20.0	03.6	255 13.5	07.8	143 22.1	01.9	231 16.6	94	18 19.7	−103
	6	9 44.7	229 37.0	+17 25.6	99 23.3	−28 03.7	270 15.3	+23 07.8	158 24.6	−10 01.9	245 45.0	96	+18 09.4	−105
	7	24 47.2	244 36.6	24.7	114 26.6	03.8	285 17.2	07.8	173 27.1	01.9	260 13.6	96	17 58.9	−106
	8	39 49.6	259 36.2	23.7	129 29.9	03.9	300 19.0	07.7	188 29.6	01.9	274 42.2	97	17 48.3	−106
	9	54 52.1	274 35.7	·· 22.8	144 33.2	·· 04.0	315 20.9	·· 07.7	203 32.0	·· 01.9	289 10.9	99	·17 37.7	−107
	10	69 54.6	289 35.3	21.9	159 36.5	04.1	330 22.7	07.7	218 34.5	01.9	303 39.8	100	17 27.0	−108
	11	84 57.0	304 34.9	20.9	174 39.9	04.2	345 24.5	07.6	233 37.0	01.9	318 08.8	100	17 16.2	−109
	12	99 59.5	319 34.4	+17 20.0	189 43.2	−28 04.3	0 26.4	+23 07.6	248 39.5	−10 01.9	332 37.8	102	+17 05.3	−110
	13	115 01.9	334 34.0	19.1	204 46.5	04.4	15 28.2	07.6	263 42.0	02.0	347 07.0	103	16 54.3	−110
	14	130 04.4	349 33.6	18.1	219 49.8	04.5	30 30.1	07.5	278 44.5	02.0	1 36.3	103	16 43.3	−111
	15	145 06.9	4 33.1	·· 17.2	234 53.1	·· 04.6	45 31.9	·· 07.5	293 46.9	·· 02.0	16 05.6	105	·16 32.2	−112
	16	160 09.3	19 32.7	16.2	249 56.4	04.7	60 33.8	07.5	308 49.4	02.0	30 35.1	106	16 21.0	−113
	17	175 11.8	34 32.3	15.3	264 59.7	04.8	75 35.6	07.4	323 51.9	02.0	45 04.7	107	16 09.7	−113
	18	190 14.3	49 31.9	+17 14.4	280 03.0	−28 04.9	90 37.5	+23 07.4	338 54.4	−10 02.0	59 34.4	108	+15 58.4	−114
	19	205 16.7	64 31.4	13.4	295 06.3	05.0	105 39.3	07.4	353 56.9	02.0	74 04.2	108	15 47.0	−115
	20	220 19.2	79 31.0	12.5	310 09.6	05.1	120 41.2	07.3	8 59.4	02.0	88 34.0	110	15 35.5	−115
	21	235 21.7	94 30.6	·· 11.5	325 12.9	·· 05.2	135 43.0	·· 07.3	24 01.8	·· 02.0	103 04.0	111	·15 24.0	−116
	22	250 24.1	109 30.2	10.6	340 16.2	05.3	150 44.9	07.3	39 04.3	02.0	117 34.1	112	15 12.4	−117
	23	265 26.6	124 29.7	09.6	355 19.6	05.4	165 46.7	07.2	54 06.8	02.0	132 04.3	113	15 00.7	−117
	24	280 29.1	139 29.3	+17 08.7	10 22.9	−28 05.5	180 48.6	+23 07.2	69 09.3	−10 02.0	146 34.6	113	+14 49.0	−118
code		—	−5	−9	+33	−1	+18	0	+25	0				

Sun partially eclipsed Northern Atlantic—Total off Labrador to Lithuania

Day	GMT h	SUN GHA ° ′		SUN Dec. ° ′
30	0	179 10.2		+23 13.4
	1	194 10.1		13.3
	2	209 09.9		13.1
	3	224 09.8	··	13.0
	4	239 09.7		12.8
	5	254 09.5		12.7
	6	269 09.4		+23 12.6
	7	284 09.3		12.4
	8	299 09.2		12.3
	9	314 09.0	··	12.1
	10	329 08.9		12.0
	11	344 08.8		11.8
	12	359 08.7		+23 11.7
	13	14 08.5		11.5
	14	29 08.4		11.4
	15	44 08.3	··	11.2
	16	59 08.2		11.1
	17	74 08.0		11.0
	18	89 07.9		+23 10.8
	19	104 07.8		10.7
	20	119 07.7		10.5
	21	134 07.5	··	10.3
	22	149 07.4		10.2
	23	164 07.3		10.0
1	0	179 07.2		+23 09.9
	1	194 07.0		09.7
	2	209 06.9		09.6
	3	224 06.8	··	09.4
	4	239 06.7		09.3
	5	254 06.5		09.1
	6	269 06.4		+23 08.9
	7	284 06.3		08.8
	8	299 06.2		08.6
	9	314 06.1	··	08.5
	10	329 05.9		08.3
	11	344 05.8		08.1
	12	359 05.7		+23 08.0
	13	14 05.6		07.8
	14	29 05.4		07.6
	15	44 05.3	··	07.5
	16	59 05.2		07.3
	17	74 05.1		07.1
	18	89 05.0		+23 07.0
	19	104 04.8		06.8
	20	119 04.7		06.6
	21	134 04.6	··	06.5
	22	149 04.5		06.3
	23	164 04.3		06.1
2	0	179 04.2		+23 06.0
	1	194 04.1		05.8
	2	209 04.0		05.6
	3	224 03.9	··	05.4
	4	239 03.7		05.3
	5	254 03.6		05.1
	6	269 03.5		+23 04.9
	7	284 03.4		04.7
	8	299 03.3		04.6
	9	314 03.1	··	04.4
	10	329 03.0		04.2
	11	344 02.9		04.0
	12	359 02.8		+23 03.9
	13	14 02.7		03.7
	14	29 02.5		03.5
	15	44 02.4	··	03.3
	16	59 02.3		03.1
	17	74 02.2		02.9
	18	89 02.1		+23 02.8
	19	104 01.9		02.6
	20	119 01.8		02.4
	21	134 01.7	··	02.2
	22	149 01.6		02.0
	23	164 01.5		01.8
	24	179 01.3		+23 01.6
	code	—		− 2

No.	Name	SHA ° ′	Dec. ° ′
7	Acamar	315 52.0	−40 28.9
5	Achernar	335 59.6	−57 27.6
30	Acrux	173 59.0	−62 51.2
19	Adhara	255 47.6	−28 54.5
10	Aldebaran	291 40.4	+16 25.2
32	Alioth	166 59.2	+56 12.6
34	Alkaid	153 33.4	+49 32.5
55	Al Na'ir	28 38.7	−47 10.6
15	Alnilam	276 31.5	− 1 13.7
25	Alphard	218 39.7	− 8 27.7
41	Alphecca	126 48.1	+26 52.0
1	Alpheratz	358 29.3	+28 50.3
51	Altair	62 51.0	+ 8 44.8
2	Ankaa	353 59.1	−42 32.8
42	Antares	113 20.2	−26 20.1
37	Arcturus	146 35.8	+19 25.1
43	Atria	109 01.2	−68 57.0
22	Avior	234 36.8	−59 21.9
13	Bellatrix	279 19.7	+ 6 18.7
16	Betelg'se	271 49.5	+ 7 24.1
17	Canopus	264 16.3	−52 40.2
12	Capella	281 40.2	+45 57.2
53	Deneb	50 01.2	+45 07.0
28	Denebola	183 18.7	+14 49.6
4	Diphda	349 40.2	−18 13.9
27	Dubhe	194 45.9	+62 00.0
14	Elnath	279 08.9	+28 34.3
47	Eltanin	91 06.1	+51 29.6
54	Enif	34 30.3	+ 9 40.0
56	Fomalhaut	16 12.4	−29 51.6
31	Gacrux	172 50.4	−56 51.9
29	Gienah	176 37.9	−17 17.6
35	Hadar	149 50.6	−60 09.6
6	Hamal	328 50.8	+23 14.9
48	Kaus Aust.	84 42.0	−34 24.5
40	Kochab	137 17.0	+74 20.7
57	Markab	14 22.2	+14 57.7
8	Menkar	315 01.5	+ 3 54.9
36	Menkent	148 59.6	−36 09.1
24	Miapl'dus	221 50.1	−69 32.0
9	Mirfak	309 44.1	+49 42.0
50	Nunki	76 52.6	−26 21.3
52	Peacock	54 28.1	−56 52.8
21	Pollux	244 22.0	+28 08.3
20	Procyon	245 46.3	+ 5 20.6
46	R'alhague	96 47.1	+12 35.5
26	Regulus	208 30.7	+12 11.4
11	Rigel	281 54.8	− 8 15.1
38	Rigil Kent.	140 52.0	−60 39.3
44	Sabik	103 02.9	−15 40.3
3	Schedar	350 31.1	+56 17.1
45	Shaula	97 21.5	−37 04.4
18	Sirius	259 13.0	−16 39.1
33	Spica	159 17.8	−10 55.6
23	Suhail	223 25.4	−43 15.1
49	Vega	81 08.5	+38 44.4
39	Zub'g'bi	137 54.2	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 30	Moonrise 1	Moonrise 2	Moonrise 3
N °	h m	h m	h m	h m	h m	h m
72	□	□	□	□	□	5 10
70	□	□	□	□	3 02	5 39
68	□	□	□	□	3 51	6 00
66	0 10	////	□	2 10	4 22	6 16
64	1 40	////	0 59	2 52	4 44	6 30
62	2 16	////	1 43	3 20	5 02	6 41
60	2 41	////	2 12	3 42	5 17	6 50
58	3 01	////	2 34	3 59	5 30	6 59
56	3 18	////	2 52	4 14	5 41	7 06
54	3 32	////	3 07	4 27	5 50	7 12
52	3 44	////	3 20	4 38	5 59	7 18
50	3 54	////	3 32	4 48	6 06	7 23
45	4 17	1 45	3 56	5 08	6 22	7 35
40	4 34	2 32	4 15	5 25	6 36	7 44
35	4 49	3 03	4 31	5 39	6 47	7 52
30	5 02	3 26	4 45	5 51	6 56	7 59
20	5 24	4 00	5 09	6 12	7 13	8 11
10	5 43	4 24	5 29	6 30	7 28	8 21
0	6 00	4 45	5 48	6 47	7 41	8 31
10	6 17	5 02	6 07	7 04	7 55	8 41
20	6 36	5 17	6 28	7 22	8 09	8 51
30	6 57	5 32	6 51	7 42	8 25	9 03
35	7 09	5 38	7 05	7 54	8 35	9 09
40	7 23	5 45	7 21	8 08	8 46	9 17
45	7 39	5 52	7 40	8 24	8 58	9 26
50	8 00	6 01	8 04	8 44	9 13	9 37
52	8 09	6 04	8 15	8 53	9 21	9 41
54	8 20	6 08	8 28	9 04	9 29	9 47
56	8 33	6 11	8 43	9 15	9 37	9 53
58	8 47	6 16	9 00	9 29	9 47	10 00
60	9 04	6 20	9 21	9 45	9 59	10 07
S						

Lat.	Sunset	Twlt. ends	Moonset 30	Moonset 1	Moonset 2	Moonset 3
N °	h m	h m	h m	h m	h m	h m
72	□	□	□	□	23 49	23 08
70	□	□	□	□	{0 09 / 23 19}	22 53
68	□	□	□	23 20	22 56	22 41
66	23 45	////	23 04	22 48	22 38	22 31
64	22 26	////	22 22	22 24	22 24	22 22
62	21 51	////	21 53	22 05	22 11	22 15
60	21 25	////	21 31	21 50	22 01	22 08
58	21 05	////	21 13	21 36	21 52	22 02
56	20 49	////	20 58	21 25	21 43	21 57
54	20 35	////	20 45	21 15	21 36	21 53
52	20 23	////	20 33	21 06	21 30	21 49
50	20 13	////	20 23	20 58	21 24	21 45
45	19 50	22 21	20 01	20 40	21 11	21 37
40	19 33	21 35	19 44	20 26	21 00	21 30
35	19 18	21 04	19 29	20 14	20 51	21 24
30	19 05	20 41	19 16	20 03	20 43	21 18
20	18 43	20 07	18 54	19 45	20 29	21 09
10	18 25	19 43	18 35	19 29	20 17	21 01
0	18 07	19 22	18 17	19 13	20 05	20 53
10	17 50	19 05	17 59	18 58	19 54	20 45
20	17 32	18 51	17 39	18 42	19 41	20 37
30	17 11	18 36	17 17	18 23	19 27	20 27
35	16 59	18 30	17 03	18 12	19 18	20 22
40	16 45	18 22	16 48	17 59	19 09	20 15
45	16 29	18 15	16 30	17 44	18 57	20 08
50	16 08	18 07	16 07	17 25	18 43	19 59
52	15 59	18 04	15 56	17 16	18 37	19 55
54	15 48	18 01	15 43	17 06	18 29	19 50
56	15 35	17 56	15 29	16 55	18 21	19 45
58	15 21	17 53	15 12	16 42	18 12	19 39
60	15 04	17 49	14 51	16 26	18 02	19 33
S						

Equation of Time (App.—Mean)

GMT h	30 m s	1 m s	2 m s
0	− 3 19.0	− 3 31.1	− 3 42.9
6	− 3 22.1	− 3 34.1	− 3 45.8
12	− 3 25.1	− 3 37.0	− 3 48.7
18	− 3 28.1	− 3 39.9	− 3 51.5
24	− 3 31.1	− 3 42.9	− 3 54.4

GMT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
30	12 03	14 40	23 29	12 04	19 32
1	13 00	14 41	23 24	12 01	19 28
2	13 53	14 42	23 19	11 58	19 24
3	14 42	14 43	23 13	11 55	19 20

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0			
	0.1	0.1	0.3
30			
	0.1	0.1	0.3
45			
	0.1	0.1	0.2
60			
	0.1	0.0	0.1
75			
	0.1	0.0	0.0
90			

Moon's Lower Limb Add

Alt. °	30 ′	1 ′	2 ′
0			
	18.1	17.3	16.4
4			
	18.1	17.3	16.4
8			
	18.1	17.3	16.4
12			
	18.0	17.3	16.4
16			
	18.0	17.3	16.4
20			
	18.0	17.2	16.4
24			
	17.9	17.2	16.4
28			
	17.8	17.1	16.3
32			
	17.8	17.1	16.3
36			
	17.7	17.0	16.3
40			
	17.6	17.0	16.3
44			
	17.5	16.9	16.2
48			
	17.4	16.8	16.2
52			
	17.3	16.8	16.2
56			
	17.2	16.7	16.1
60			
	17.0	16.6	16.1
64			
	16.9	16.5	16.0
68			
	16.8	16.4	16.0
72			
	16.6	16.3	15.9
76			
	16.5	16.2	15.9
80			
	16.4	16.1	15.8
84			
	16.2	16.0	15.8
88			
	16.1	16.0	15.8
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt. °	30 ′	1 ′	2 ′
0			
	14.1	14.5	15.0
4			
	14.1	14.5	15.0
8			
	14.1	14.6	15.1
12			
	14.2	14.6	15.1
16			
	14.2	14.6	15.1
20			
	14.2	14.6	15.1
24			
	14.3	14.7	15.1
28			
	14.4	14.7	15.1
32			
	14.4	14.8	15.2
36			
	14.5	14.8	15.2
40			
	14.6	14.9	15.2
44			
	14.7	15.0	15.3
48			
	14.8	15.0	15.3
52			
	14.9	15.1	15.3
56			
	15.0	15.2	15.4
60			
	15.2	15.3	15.4
64			
	15.3	15.4	15.5
68			
	15.4	15.5	15.5
72			
	15.5	15.5	15.5
76			
	15.7	15.6	15.6
80			
	15.8	15.7	15.6
84			
	16.0	15.8	15.7
88			
	16.1	15.9	15.7
90			

Subtract from table, back cover

New Moon 30

GMT	♈ GHA	VENUS −3.5 GHA	VENUS Dec.	MARS −2.2 GHA	MARS Dec.	JUPITER −1.4 GHA	JUPITER Dec.	SATURN 0.7 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
3 0	280 29.1	139 29.3	+17 08.7	10 22.9	−28 05.5	180 48.6	+23 07.2	69 09.3	−10 02.0	146 34.6	113	+14 49.0	−118
1	295 31.5	154 28.9	07.7	25 26.2	05.6	195 50.4	07.2	84 11.8	02.0	161 04.9	115	14 37.2	−118
2	310 34.0	169 28.5	06.8	40 29.5	05.7	210 52.3	07.1	99 14.3	02.0	175 35.4	116	14 25.4	−119
3	325 36.4	184 28.0	·· 05.8	55 32.8	·· 05.8	225 54.1	·· 07.1	114 16.7	·· 02.0	190 06.0	116	·14 13.5	−120
4	340 38.9	199 27.6	04.9	70 36.1	05.9	240 56.0	07.1	129 19.2	02.0	204 36.6	118	14 01.5	−120
5	355 41.4	214 27.2	03.9	85 39.4	06.0	255 57.8	07.0	144 21.7	02.0	219 07.4	118	13 49.5	−120
6	10 43.8	229 26.8	+17 03.0	100 42.7	−28 06.0	270 59.7	+23 07.0	159 24.2	−10 02.0	233 38.2	120	+13 37.5	−121
7	25 46.3	244 26.4	02.0	115 46.0	06.1	286 01.5	07.0	174 26.7	02.0	248 09.2	120	13 25.4	−122
8	40 48.8	259 25.9	01.1	130 49.3	06.2	301 03.4	06.9	189 29.1	02.1	262 40.2	121	13 13.2	−122
9	55 51.2	274 25.5	·17 00.1	145 52.6	·· 06.3	316 05.2	·· 06.9	204 31.6	·· 02.1	277 11.3	122	·13 01.0	−123
10	70 53.7	289 25.1	16 59.2	160 55.9	06.4	331 07.1	06.9	219 34.1	02.1	291 42.5	123	12 48.7	−123
11	85 56.2	304 24.7	58.2	175 59.2	06.5	346 08.9	06.8	234 36.6	02.1	306 13.8	124	12 36.4	−123
12	100 58.6	319 24.3	+16 57.3	191 02.5	−28 06.6	1 10.8	+23 06.8	249 39.1	−10 02.1	320 45.2	125	+12 24.1	−124
13	116 01.1	334 23.9	56.3	206 05.8	06.7	16 12.6	06.8	264 41.6	02.1	335 16.7	125	12 11.7	−125
14	131 03.5	349 23.4	55.3	221 09.1	06.8	31 14.4	06.7	279 44.0	02.1	349 48.2	127	11 59.2	−125
15	146 06.0	4 23.0	·· 54.4	236 12.4	·· 06.9	46 16.3	·· 06.7	294 46.5	·· 02.1	4 19.9	127	·11 46.7	−125
16	161 08.5	19 22.6	53.4	251 15.7	07.0	61 18.1	06.7	309 49.0	02.1	18 51.6	128	11 34.2	−125
17	176 10.9	34 22.2	52.5	266 19.0	07.1	76 20.0	06.6	324 51.5	02.1	33 23.4	129	11 21.7	−126
18	191 13.4	49 21.8	+16 51.5	281 22.3	−28 07.1	91 21.8	+23 06.6	339 53.9	−10 02.1	47 55.3	130	+11 09.1	−127
19	206 15.9	64 21.4	50.6	296 25.5	07.2	106 23.7	06.6	354 56.4	02.1	62 27.3	130	10 56.4	−126
20	221 18.3	79 21.0	49.6	311 28.8	07.3	121 25.5	06.5	9 58.9	02.1	76 59.3	131	10 43.8	−127
21	236 20.8	94 20.6	·· 48.6	326 32.1	·· 07.4	136 27.4	·· 06.5	25 01.4	·· 02.1	91 31.4	133	·10 31.1	−128
22	251 23.3	109 20.2	47.7	341 35.4	07.5	151 29.2	06.5	40 03.9	02.1	106 03.7	132	10 18.3	−127
23	266 25.7	124 19.8	46.7	356 38.7	07.6	166 31.1	06.4	55 06.3	02.1	120 35.9	134	10 05.6	−128
4 0	281 28.2	139 19.3	+16 45.7	11 42.0	−28 07.7	181 32.9	+23 06.4	70 08.8	−10 02.2	135 08.3	134	+ 9 52.8	−129
1	296 30.7	154 18.9	44.8	26 45.3	07.8	196 34.8	06.3	85 11.3	02.2	149 40.7	135	9 39.9	−128
2	311 33.1	169 18.5	43.8	41 48.6	07.9	211 36.6	06.3	100 13.8	02.2	164 13.2	136	9 27.1	−129
3	326 35.6	184 18.1	·· 42.8	56 51.9	·· 07.9	226 38.5	·· 06.3	115 16.3	·· 02.2	178 45.8	137	· 9 14.2	−129
4	341 38.0	199 17.7	41.9	71 55.2	08.0	241 40.3	06.2	130 18.7	02.2	193 18.5	137	9 01.3	−129
5	356 40.5	214 17.3	40.9	86 58.4	08.1	256 42.2	06.2	145 21.2	02.2	207 51.2	138	8 48.4	−130
6	11 43.0	229 16.9	+16 39.9	102 01.7	−28 08.2	271 44.0	+23 06.2	160 23.7	−10 02.2	222 24.0	138	+ 8 35.4	−130
7	26 45.4	244 16.5	39.0	117 05.0	08.3	286 45.9	06.1	175 26.2	02.2	236 56.8	140	8 22.4	−130
8	41 47.9	259 16.1	38.0	132 08.3	08.4	301 47.7	06.1	190 28.6	02.2	251 29.8	140	8 09.4	−130
9	56 50.4	274 15.7	·· 37.0	147 11.6	·· 08.5	316 49.6	·· 06.1	205 31.1	·· 02.2	266 02.8	140	· 7 56.4	−130
10	71 52.8	289 15.3	36.1	162 14.9	08.5	331 51.4	06.0	220 33.6	02.2	280 35.8	141	7 43.4	−131
11	86 55.3	304 14.9	35.1	177 18.2	08.6	346 53.3	06.0	235 36.1	02.2	295 08.9	142	7 30.3	−131
12	101 57.8	319 14.5	+16 34.1	192 21.4	−28 08.7	1 55.1	+23 06.0	250 38.5	−10 02.2	309 42.1	143	+ 7 17.2	−130
13	117 00.2	334 14.1	33.1	207 24.7	08.8	16 57.0	05.9	265 41.0	02.2	324 15.4	143	7 04.2	−132
14	132 02.7	349 13.7	32.2	222 28.0	08.9	31 58.8	05.9	280 43.5	02.3	338 48.7	144	6 51.0	−131
15	147 05.2	4 13.3	·· 31.2	237 31.3	·· 09.0	47 00.7	·· 05.9	295 46.0	·· 02.3	353 22.1	144	· 6 37.9	−131
16	162 07.6	19 12.9	30.2	252 34.6	09.1	62 02.5	05.8	310 48.5	02.3	7 55.5	145	6 24.8	−132
17	177 10.1	34 12.5	29.2	267 37.8	09.1	77 04.4	05.8	325 50.9	02.3	22 29.0	145	6 11.6	−131
18	192 12.5	49 12.1	+16 28.3	282 41.1	−28 09.2	92 06.2	+23 05.7	340 53.4	−10 02.3	37 02.5	146	+ 5 58.5	−132
19	207 15.0	64 11.7	27.3	297 44.4	09.3	107 08.1	05.7	355 55.9	02.3	51 36.1	147	5 45.3	−132
20	222 17.5	79 11.3	26.3	312 47.7	09.4	122 09.9	05.7	10 58.4	02.3	66 09.8	147	5 32.1	−132
21	237 19.9	94 10.9	·· 25.3	327 51.0	·· 09.5	137 11.8	·· 05.6	26 00.8	·· 02.3	80 43.5	147	· 5 18.9	−131
22	252 22.4	109 10.5	24.4	342 54.2	09.5	152 13.6	05.6	41 03.3	02.3	95 17.2	148	5 05.8	−132
23	267 24.9	124 10.1	23.4	357 57.5	09.6	167 15.5	05.6	56 05.8	02.3	109 51.0	149	4 52.6	−133
5 0	282 27.3	139 09.8	+16 22.4	13 00.8	−28 09.7	182 17.3	+23 05.5	71 08.3	−10 02.3	124 24.9	149	+ 4 39.3	−132
1	297 29.8	154 09.4	21.4	28 04.1	09.8	197 19.1	05.5	86 10.7	02.3	138 58.8	149	4 26.1	−132
2	312 32.3	169 09.0	20.4	43 07.3	09.9	212 21.0	05.5	101 13.2	02.3	153 32.7	150	4 12.9	−132
3	327 34.7	184 08.6	·· 19.4	58 10.6	·· 10.0	227 22.8	·· 05.4	116 15.7	·· 02.4	168 06.7	151	· 3 59.7	−132
4	342 37.2	199 08.2	18.5	73 13.9	10.0	242 24.7	05.4	131 18.2	02.4	182 40.8	151	3 46.5	−133
5	357 39.6	214 07.8	17.5	88 17.1	10.1	257 26.5	05.4	146 20.6	02.4	197 14.9	151	3 33.2	−132
6	12 42.1	229 07.4	+16 16.5	103 20.4	−28 10.2	272 28.4	+23 05.3	161 23.1	−10 02.4	211 49.0	152	+ 3 20.0	−132
7	27 44.6	244 07.0	15.5	118 23.7	10.3	287 30.2	05.3	176 25.6	02.4	226 23.2	152	3 06.8	−132
8	42 47.0	259 06.6	14.5	133 27.0	10.3	302 32.1	05.2	191 28.0	02.4	240 57.4	153	2 53.6	−132
9	57 49.5	274 06.3	·· 13.5	148 30.2	·· 10.4	317 33.9	·· 05.2	206 30.5	·· 02.4	255 31.7	153	· 2 40.4	−133
10	72 52.0	289 05.9	12.5	163 33.5	10.5	332 35.8	05.2	221 33.0	02.4	270 06.0	153	2 27.1	−132
11	87 54.4	304 05.5	11.6	178 36.8	10.6	347 37.6	05.1	236 35.5	02.4	284 40.3	154	2 13.9	−132
12	102 56.9	319 05.1	+16 10.6	193 40.0	−28 10.7	2 39.5	+23 05.1	251 37.9	−10 02.4	299 14.7	154	+ 2 00.7	−132
13	117 59.4	334 04.7	09.6	208 43.3	10.7	17 41.3	05.1	266 40.4	02.4	313 49.1	154	1 47.5	−132
14	133 01.8	349 04.3	08.6	223 46.6	10.8	32 43.2	05.0	281 42.9	02.5	328 23.5	155	1 34.3	−132
15	148 04.3	4 03.9	·· 07.6	238 49.8	·· 10.9	47 45.0	·· 05.0	296 45.4	·· 02.5	342 58.0	155	· 1 21.1	−132
16	163 06.8	19 03.6	06.6	253 53.1	11.0	62 46.9	05.0	311 47.8	02.5	357 32.5	155	1 07.9	−132
17	178 09.2	34 03.2	05.6	268 56.3	11.0	77 48.7	04.9	326 50.3	02.5	12 07.0	156	0 54.7	−131
18	193 11.7	49 02.8	+16 04.6	283 59.6	−28 11.1	92 50.6	+23 04.9	341 52.8	−10 02.5	26 41.6	156	+ 0 41.6	−132
19	208 14.1	64 02.4	03.6	299 02.9	11.2	107 52.4	04.8	356 55.2	02.5	41 16.2	156	0 28.4	−131
20	223 16.6	79 02.0	02.6	314 06.1	11.3	122 54.3	04.8	11 57.7	02.5	55 50.8	156	0 15.3	−132
21	238 19.1	94 01.7	·· 01.6	329 09.4	·· 11.3	137 56.1	·· 04.8	27 00.2	·· 02.5	70 25.4	157	+ 0 02.1	−131
22	253 21.5	109 01.3	16 00.6	344 12.6	11.4	152 58.0	04.7	42 02.7	02.5	85 00.1	157	− 0 11.0	−131
23	268 24.0	124 00.9	15 59.6	359 15.9	11.5	167 59.8	04.7	57 05.1	02.5	99 34.8	157	0 24.1	−131
24	283 26.5	139 00.5	+15 58.6	14 19.2	−28 11.6	183 01.7	+23 04.7	72 07.6	−10 02.5	114 09.5	158	− 0 37.2	−131
code	—	− 4	− 10	+ 33	− 1	+ 19	− 1	+ 25	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
3 0	179 01.3	+23 01.6
1	194 01.2	01.4
2	209 01.1	01.3
3	224 01.0 ••	01.1
4	239 00.9	00.9
5	254 00.7	00.7
6	269 00.6	+23 00.5
7	284 00.5	00.3
8	299 00.4	23 00.1
9	314 00.3	22 59.9
10	329 00.2	59.7
11	344 00.0	59.5
12	358 59.9	+22 59.3
13	13 59.8	59.1
14	28 59.7	58.9
15	43 59.6 ••	58.7
16	58 59.5	58.5
17	73 59.3	58.3
18	88 59.2	+22 58.1
19	103 59.1	57.9
20	118 59.0	57.7
21	133 58.9 ••	57.5
22	148 58.8	57.3
23	163 58.6	57.1
4 0	178 58.5	+22 56.9
1	193 58.4	56.7
2	208 58.3	56.5
3	223 58.2 ••	56.3
4	238 58.1	56.1
5	253 58.0	55.9
6	268 57.8	+22 55.7
7	283 57.7	55.5
8	298 57.6	55.2
9	313 57.5 ••	55.0
10	328 57.4	54.8
11	343 57.3	54.6
12	358 57.2	+22 54.4
13	13 57.0	54.2
14	28 56.9	54.0
15	43 56.8 ••	53.8
16	58 56.7	53.5
17	73 56.6	53.3
18	88 56.5	+22 53.1
19	103 56.4	52.9
20	118 56.3	52.7
21	133 56.1 ••	52.4
22	148 56.0	52.2
23	163 55.9	52.0
5 0	178 55.8	+22 51.8
1	193 55.7	51.6
2	208 55.6	51.3
3	223 55.5 ••	51.1
4	238 55.4	50.9
5	253 55.2	50.7
6	268 55.1	+22 50.4
7	283 55.0	50.2
8	298 54.9	50.0
9	313 54.8 ••	49.8
10	328 54.7	49.5
11	343 54.6	49.3
12	358 54.5	+22 49.1
13	13 54.4	48.8
14	28 54.2	48.6
15	43 54.1 ••	48.4
16	58 54.0	48.1
17	73 53.9	47.9
18	88 53.8	+22 47.7
19	103 53.7	47.4
20	118 53.6	47.2
21	133 53.5 ••	47.0
22	148 53.4	46.7
23	163 53.3	46.5
24	178 53.2	+22 46.3
code	—	− 2

STARS

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 52.0	−40 28.9
5	Achernar	335 59.6	−57 27.6
30	Acrux	173 59.0	−62 51.2
19	Adhara	255 47.6	−28 54.5
10	Aldebaran	291 40.4	+16 25.2
32	Alioth	166 59.2	+56 12.6
34	Alkaid	153 33.4	+49 32.5
55	Al Na'ir	28 38.7	−47 10.6
15	Alnilam	276 31.5	− 1 13.7
25	Alphard	218 39.8	− 8 27.7
41	Alphecca	126 48.1	+26 52.1
1	Alpheratz	358 29.2	+28 50.3
51	Altair	62 51.0	+ 8 44.9
2	Ankaa	353 59.1	−42 32.8
42	Antares	113 20.2	−26 20.1
37	Arcturus	146 35.8	+19 25.1
43	Atria	109 01.2	−68 57.0
22	Avior	234 36.8	−59 21.9
13	Bellatrix	279 19.7	+ 6 18.7
16	Betelg'se	271 49.4	+ 7 24.1
17	Canopus	264 16.3	−52 40.1
12	Capella	281 40.2	+45 57.2
53	Deneb	50 01.2	+45 07.0
28	Denebola	183 18.7	+14 49.6
4	Diphda	349 40.1	−18 13.9
27	Dubhe	194 45.9	+62 00.0
14	Elnath	279 08.8	+28 34.3
47	Eltanin	91 06.1	+51 29.7
54	Enif	34 30.2	+ 9 40.0
56	Fomalhaut	16 12.4	−29 51.6
31	Gacrux	172 50.4	−56 51.9
29	Gienah	176 37.9	−17 17.6
35	Hadar	149 50.6	−60 09.6
6	Hamal	328 50.8	+23 14.9
48	Kaus Aust.	84 42.0	−34 24.5
40	Kochab	137 17.1	+74 20.7
57	Markab	14 22.2	+14 57.7
8	Menkar	315 01.5	+ 3 54.9
36	Menkent	148 59.6	−36 09.1
24	Miapl'dus	221 50.1	−69 32.0
9	Mirfak	309 44.1	+49 42.0
50	Nunki	76 52.6	−26 21.3
52	Peacock	54 28.1	−56 52.8
21	Pollux	244 22.0	+28 08.3
20	Procyon	245 46.3	+ 5 20.6
46	R'alhague	96 47.1	+12 35.5
26	Regulus	208 30.7	+12 11.4
11	Rigel	281 54.8	− 8 15.1
38	Rigil Kent.	140 52.0	−60 39.3
44	Sabik	103 02.9	−15 40.3
3	Schedar	350 31.1	+56 17.1
45	Shaula	97 21.5	−37 04.4
18	Sirius	259 13.0	−16 39.1
33	Spica	159 17.8	−10 55.6
23	Suhail	223 25.4	−43 15.1
49	Vega	81 08.4	+38 44.4
39	Zub'g'bi	137 54.2	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 3	Moonrise 4	Moonrise 5	Moonrise 6
N °	h m	h m	h m	h m	h m	h m
72	▭	▭	5 10	7 29	9 28	11 22
70	▭	▭	5 39	7 41	9 32	11 17
68	▭	▭	6 00	7 52	9 35	11 14
66	0 38	////	6 16	8 00	9 37	11 11
64	1 46	////	6 30	8 07	9 39	11 08
62	2 20	////	6 41	8 13	9 41	11 06
60	2 45	////	6 50	8 19	9 42	11 04
58	3 04	////	6 59	8 23	9 44	11 02
56	3 20	////	7 06	8 27	9 45	11 00
54	3 34	////	7 12	8 31	9 46	10 59
52	3 46	////	7 18	8 34	9 47	10 58
50	3 57	////	7 23	8 37	9 48	10 57
45	4 18	1 48	7 35	8 44	9 50	10 54
40	4 36	2 33	7 44	8 49	9 52	10 52
35	4 51	3 04	7 52	8 54	9 53	10 50
30	5 03	3 27	7 59	8 58	9 54	10 49
20	5 25	4 01	8 11	9 05	9 56	10 46
10	5 43	4 26	8 21	9 11	9 58	10 44
0	6 01	4 45	8 31	9 17	10 00	10 42
10	6 18	5 03	8 41	9 23	10 02	10 40
20	6 36	5 18	8 51	9 29	10 04	10 37
30	6 57	5 32	9 03	9 36	10 06	10 35
35	7 09	5 39	9 09	9 40	10 07	10 33
40	7 22	5 45	9 17	9 44	10 09	10 32
45	7 39	5 53	9 26	9 49	10 10	10 30
50	7 59	6 00	9 37	9 56	10 12	10 28
52	8 08	6 04	9 41	9 58	10 13	10 27
54	8 19	6 08	9 47	10 02	10 14	10 26
56	8 31	6 11	9 53	10 05	10 15	10 24
58	8 45	6 15	10 00	10 09	10 16	10 23
60	9 02	6 19	10 07	10 13	10 18	10 22
S						

Lat.	Sunset	Twlt. ends	Moonset 3	Moonset 4	Moonset 5	Moonset 6
N °	h m	h m	h m	h m	h m	h m
72	▭	▭	23 08	22 40	22 16	21 52
70	▭	▭	22 53	22 34	22 17	22 00
68	▭	▭	22 41	22 28	22 17	22 06
66	23 25	////	22 31	22 24	22 17	22 11
64	22 21	////	22 22	22 20	22 17	22 15
62	21 47	////	22 15	22 17	22 18	22 19
60	21 23	////	22 08	22 14	22 18	22 22
58	21 03	////	22 02	22 11	22 18	22 25
56	20 48	////	21 57	22 08	22 18	22 28
54	20 34	////	21 53	22 06	22 18	22 30
52	20 22	////	21 49	22 04	22 19	22 32
50	20 12	////	21 45	22 03	22 19	22 34
45	19 50	22 19	21 37	21 59	22 19	22 39
40	19 32	21 33	21 30	21 55	22 19	22 42
35	19 18	21 04	21 24	21 53	22 19	22 46
30	19 05	20 41	21 18	21 50	22 19	22 48
20	18 44	20 08	21 09	21 46	22 20	22 53
10	18 25	19 42	21 01	21 42	22 20	22 57
0	18 08	19 23	20 53	21 38	22 20	23 02
10	17 51	19 06	20 45	21 34	22 20	23 06
20	17 33	18 51	20 37	21 30	22 21	23 10
30	17 13	18 38	20 27	21 25	22 21	23 15
35	17 01	18 31	20 22	21 23	22 21	23 18
40	16 47	18 24	20 15	21 20	22 21	23 21
45	16 30	18 16	20 08	21 16	22 21	23 25
50	16 10	18 09	19 59	21 12	22 21	23 29
52	16 01	18 06	19 55	21 10	22 21	23 31
54	15 50	18 02	19 50	21 07	22 21	23 34
56	15 38	17 59	19 45	21 05	22 21	23 36
58	15 24	17 55	19 39	21 02	22 21	23 39
60	15 07	17 51	19 33	20 59	22 21	23 42
S						

GMT	Equation of Time (App.—Mean) 3	4	5
h	m s	m s	m s
0	− 3 54.4	− 4 05.6	− 4 16.6
6	− 3 57.2	− 4 08.4	− 4 19.2
12	− 4 00.1	− 4 11.1	− 4 21.9
18	− 4 02.9	− 4 13.9	− 4 24.5
24	− 4 05.6	− 4 16.6	− 4 27.2

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
3	14 42	14 43	23 13	11 55	19 20
4	15 27	14 43	23 08	11 52	19 16
5	16 10	14 44	23 03	11 49	19 12
6	16 52	14 44	22 58	11 46	19 08

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.1	0.1	0.3
30			
	0.1	0.1	0.3
45			
	0.1	0.1	0.2
60			
	0.1	0.0	0.1
75			
	0.1	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	3	4	5
°	′	′	′
0			
	15.4	14.4	13.6
4			
	15.4	14.4	13.7
8			
	15.4	14.4	13.7
12			
	15.4	14.4	13.7
16			
	15.4	14.4	13.7
20			
	15.4	14.5	13.8
24			
	15.4	14.5	13.8
28			
	15.4	14.5	13.8
32			
	15.4	14.6	13.9
36			
	15.4	14.6	14.0
40			
	15.4	14.6	14.0
44			
	15.5	14.7	14.1
48			
	15.5	14.7	14.2
52			
	15.5	14.8	14.3
56			
	15.5	14.8	14.3
60			
	15.5	14.9	14.4
64			
	15.5	14.9	14.5
68			
	15.5	15.0	14.6
72			
	15.5	15.1	14.7
76			
	15.5	15.1	14.8
80			
	15.5	15.2	14.9
84			
	15.5	15.2	15.0
88			
	15.5	15.3	15.1
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	3	4	5
°	′	′	′
0			
	15.6	16.2	16.6
4			
	15.6	16.2	16.6
8			
	15.6	16.2	16.6
12			
	15.6	16.2	16.6
16			
	15.6	16.2	16.6
20			
	15.6	16.1	16.5
24			
	15.6	16.1	16.5
28			
	15.6	16.1	16.4
32			
	15.6	16.1	16.4
36			
	15.6	16.0	16.3
40			
	15.6	16.0	16.3
44			
	15.6	15.9	16.2
48			
	15.6	15.9	16.1
52			
	15.6	15.8	16.0
56			
	15.6	15.8	15.9
60			
	15.6	15.7	15.8
64			
	15.6	15.7	15.8
68			
	15.6	15.6	15.7
72			
	15.6	15.6	15.6
76			
	15.5	15.5	15.5
80			
	15.5	15.4	15.4
84			
	15.5	15.4	15.2
88			
	15.5	15.3	15.2
90			

Subtract from table, back cover

Independence Day 4

GMT	♈ GHA	VENUS −3.5 GHA	VENUS Dec.	MARS −2.2 GHA	MARS Dec.	JUPITER −1.4 GHA	JUPITER Dec.	SATURN 0.8 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
6 0	283 26.5	139 00.5	+15 58.6	14 19.2	−28 11.6	183 01.7	+23 04.7	72 07.6	−10 02.5	114 09.5	158	− 0 37.2	−131
1	298 28.9	154 00.2	57.7	29 22.4	11.6	198 03.5	04.6	87 10.1	02.6	128 44.3	157	0 50.3	−131
2	313 31.4	168 59.8	56.7	44 25.7	11.7	213 05.4	04.6	102 12.5	02.6	143 19.0	158	1 03.4	−130
3	328 33.9	183 59.4	·· 55.7	59 28.9	·· 11.8	228 07.2	·· 04.6	117 15.0	·· 02.6	157 53.8	158	· 1 16.4	−131
4	343 36.3	198 59.0	54.7	74 32.2	11.9	243 09.1	04.5	132 17.5	02.6	172 28.6	158	1 29.5	−130
5	358 38.8	213 58.7	53.7	89 35.4	11.9	258 10.9	04.5	147 19.9	02.6	187 03.4	159	1 42.5	−130
6	13 41.3	228 58.3	+15 52.7	104 38.7	−28 12.0	273 12.8	+23 04.4	162 22.4	−10 02.6	201 38.3	158	− 1 55.5	−130
7	28 43.7	243 57.9	51.7	119 41.9	12.1	288 14.6	04.4	177 24.9	02.6	216 13.1	159	2 08.5	−129
8	43 46.2	258 57.5	50.7	134 45.2	12.2	303 16.5	04.4	192 27.4	02.6	230 48.0	159	2 21.4	−130
9	58 48.6	273 57.2	·· 49.6	149 48.4	·· 12.2	318 18.3	·· 04.3	207 29.8	·· 02.6	245 22.9	159	· 2 34.4	−129
10	73 51.1	288 56.8	48.6	164 51.7	12.3	333 20.2	04.3	222 32.3	02.6	259 57.8	159	2 47.3	−129
11	88 53.6	303 56.4	47.6	179 54.9	12.4	348 22.0	04.3	237 34.8	02.7	274 32.7	159	3 00.2	−129
12	103 56.0	318 56.1	+15 46.6	194 58.2	−28 12.4	3 23.9	+23 04.2	252 37.2	−10 02.7	289 07.6	160	− 3 13.1	−129
13	118 58.5	333 55.7	45.6	210 01.4	12.5	18 25.7	04.2	267 39.7	02.7	303 42.6	159	3 26.0	−128
14	134 01.0	348 55.3	44.6	225 04.7	12.6	33 27.6	04.1	282 42.2	02.7	318 17.5	159	3 38.8	−128
15	149 03.4	3 55.0	·· 43.6	240 07.9	·· 12.6	48 29.4	·· 04.1	297 44.6	·· 02.7	332 52.4	160	· 3 51.6	−128
16	164 05.9	18 54.6	42.6	255 11.1	12.7	63 31.3	04.1	312 47.1	02.7	347 27.4	159	4 04.4	−128
17	179 08.4	33 54.2	41.6	270 14.4	12.8	78 33.1	04.0	327 49.6	02.7	2 02.3	160	4 17.2	−127
18	194 10.8	48 53.9	+15 40.6	285 17.6	−28 12.9	93 35.0	+23 04.0	342 52.0	−10 02.7	16 37.3	160	− 4 29.9	−128
19	209 13.3	63 53.5	39.6	300 20.9	12.9	108 36.8	04.0	357 54.5	02.7	31 12.3	159	4 42.7	−126
20	224 15.7	78 53.1	38.6	315 24.1	13.0	123 38.7	03.9	12 57.0	02.7	45 47.2	160	4 55.3	−127
21	239 18.2	93 52.8	·· 37.6	330 27.3	·· 13.1	138 40.5	·· 03.9	27 59.4	·· 02.8	60 22.2	160	· 5 08.0	−126
22	254 20.7	108 52.4	36.6	345 30.6	13.1	153 42.4	03.8	43 01.9	02.8	74 57.2	159	5 20.6	−126
23	269 23.1	123 52.0	35.5	0 33.8	13.2	168 44.2	03.8	58 04.4	02.8	89 32.1	160	5 33.2	−126
7 0	284 25.6	138 51.7	+15 34.5	15 37.1	−28 13.3	183 46.1	+23 03.8	73 06.8	−10 02.8	104 07.1	160	− 5 45.8	−126
1	299 28.1	153 51.3	33.5	30 40.3	13.3	198 47.9	03.7	88 09.3	02.8	118 42.1	159	5 58.4	−125
2	314 30.5	168 51.0	32.5	45 43.5	13.4	213 49.8	03.7	103 11.8	02.8	133 17.0	160	6 10.9	−125
3	329 33.0	183 50.6	·· 31.5	60 46.8	·· 13.5	228 51.6	·· 03.7	118 14.2	·· 02.8	147 52.0	159	· 6 23.4	−124
4	344 35.5	198 50.2	30.5	75 50.0	13.5	243 53.5	03.6	133 16.7	02.8	162 26.9	160	6 35.8	−124
5	359 37.9	213 49.9	29.5	90 53.2	13.6	258 55.3	03.6	148 19.2	02.8	177 01.9	159	6 48.2	−124
6	14 40.4	228 49.5	+15 28.4	105 56.5	−28 13.7	273 57.2	+23 03.5	163 21.6	−10 02.9	191 36.8	160	− 7 00.6	−124
7	29 42.9	243 49.2	27.4	120 59.7	13.7	288 59.0	03.5	178 24.1	02.9	206 11.8	159	7 13.0	−123
8	44 45.3	258 48.8	26.4	136 02.9	13.8	304 00.9	03.5	193 26.6	02.9	220 46.7	159	7 25.3	−123
9	59 47.8	273 48.5	·· 25.4	151 06.1	·· 13.9	319 02.7	·· 03.4	208 29.0	·· 02.9	235 21.6	159	· 7 37.6	−122
10	74 50.2	288 48.1	24.4	166 09.4	13.9	334 04.6	03.4	223 31.5	02.9	249 56.5	159	7 49.8	−122
11	89 52.7	303 47.8	23.4	181 12.6	14.0	349 06.4	03.4	238 34.0	02.9	264 31.4	158	8 02.0	−122
12	104 55.2	318 47.4	+15 22.3	196 15.8	−28 14.1	4 08.3	+23 03.3	253 36.4	−10 02.9	279 06.2	159	− 8 14.2	−121
13	119 57.6	333 47.1	21.3	211 19.0	14.1	19 10.1	03.3	268 38.9	02.9	293 41.1	158	8 26.3	−121
14	135 00.1	348 46.7	20.3	226 22.3	14.2	34 12.0	03.2	283 41.4	03.0	308 15.9	158	8 38.4	−121
15	150 02.6	3 46.3	·· 19.3	241 25.5	·· 14.2	49 13.8	·· 03.2	298 43.8	·· 03.0	322 50.7	159	· 8 50.5	−120
16	165 05.0	18 46.0	18.2	256 28.7	14.3	64 15.7	03.2	313 46.3	03.0	337 25.6	157	9 02.5	−120
17	180 07.5	33 45.6	17.2	271 31.9	14.4	79 17.5	03.1	328 48.7	03.0	352 00.3	158	9 14.5	−119
18	195 10.0	48 45.3	+15 16.2	286 35.1	−28 14.4	94 19.4	+23 03.1	343 51.2	−10 03.0	6 35.1	158	− 9 26.4	−119
19	210 12.4	63 44.9	15.2	301 38.4	14.5	109 21.2	03.0	358 53.7	03.0	21 09.9	157	9 38.3	−119
20	225 14.9	78 44.6	14.1	316 41.6	14.6	124 23.1	03.0	13 56.1	03.0	35 44.6	157	9 50.2	−118
21	240 17.4	93 44.3	·· 13.1	331 44.8	·· 14.6	139 24.9	·· 03.0	28 58.6	·· 03.0	50 19.3	157	·10 02.0	−118
22	255 19.8	108 43.9	12.1	346 48.0	14.7	154 26.8	02.9	44 01.1	03.0	64 54.0	156	10 13.8	−117
23	270 22.3	123 43.6	11.1	1 51.2	14.7	169 28.6	02.9	59 03.5	03.1	79 28.6	157	10 25.5	−117
8 0	285 24.7	138 43.2	+15 10.0	16 54.4	−28 14.8	184 30.5	+23 02.9	74 06.0	−10 03.1	94 03.3	156	−10 37.2	−116
1	300 27.2	153 42.9	09.0	31 57.7	14.9	199 32.3	02.8	89 08.4	03.1	108 37.9	156	10 48.8	−116
2	315 29.7	168 42.5	08.0	47 00.9	14.9	214 34.2	02.8	104 10.9	03.1	123 12.5	155	11 00.4	−115
3	330 32.1	183 42.2	·· 07.0	62 04.1	·· 15.0	229 36.0	·· 02.7	119 13.4	·· 03.1	137 47.0	155	·11 11.9	−115
4	345 34.6	198 41.8	05.9	77 07.3	15.0	244 37.9	02.7	134 15.8	03.1	152 21.5	155	11 23.4	−115
5	0 37.1	213 41.5	04.9	92 10.5	15.1	259 39.7	02.7	149 18.3	03.1	166 56.0	155	11 34.9	−114
6	15 39.5	228 41.2	+15 03.9	107 13.7	−28 15.2	274 41.6	+23 02.6	164 20.8	−10 03.1	181 30.5	155	−11 46.3	−114
7	30 42.0	243 40.8	02.8	122 16.9	15.2	289 43.4	02.6	179 23.2	03.2	196 05.0	154	11 57.7	−113
8	45 44.5	258 40.5	01.8	137 20.1	15.3	304 45.3	02.5	194 25.7	03.2	210 39.4	153	12 09.0	−112
9	60 46.9	273 40.1	·15 00.8	152 23.3	·· 15.3	319 47.1	·· 02.5	209 28.1	·· 03.2	225 13.7	154	·12 20.2	−112
10	75 49.4	288 39.8	14 59.7	167 26.5	15.4	334 49.0	02.5	224 30.6	03.2	239 48.1	153	12 31.4	−112
11	90 51.8	303 39.5	58.7	182 29.7	15.4	349 50.8	02.4	239 33.1	03.2	254 22.4	153	12 42.6	−111
12	105 54.3	318 39.1	+14 57.7	197 32.9	−28 15.5	4 52.7	+23 02.4	254 35.5	−10 03.2	268 56.7	152	−12 53.7	−110
13	120 56.8	333 38.8	56.6	212 36.1	15.6	19 54.5	02.3	269 38.0	03.2	283 30.9	152	13 04.7	−110
14	135 59.2	348 38.4	55.6	227 39.3	15.6	34 56.4	02.3	284 40.4	03.3	298 05.1	152	13 15.7	−110
15	151 01.7	3 38.1	·· 54.6	242 42.5	·· 15.7	49 58.2	·· 02.3	299 42.9	·· 03.3	312 39.3	151	·13 26.7	−108
16	166 04.2	18 37.8	53.5	257 45.7	15.7	65 00.1	02.2	314 45.4	03.3	327 13.4	151	13 37.5	−109
17	181 06.6	33 37.4	52.5	272 48.9	15.8	80 01.9	02.2	329 47.8	03.3	341 47.5	150	13 48.4	−107
18	196 09.1	48 37.1	+14 51.4	287 52.1	−28 15.8	95 03.8	+23 02.2	344 50.3	−10 03.3	356 21.5	150	−13 59.1	−108
19	211 11.6	63 36.8	50.4	302 55.3	15.9	110 05.6	02.1	359 52.7	03.3	10 55.5	150	14 09.9	−106
20	226 14.0	78 36.4	49.4	317 58.5	16.0	125 07.5	02.1	14 55.2	03.3	25 29.5	149	14 20.5	−106
21	241 16.5	93 36.1	·· 48.3	333 01.7	·· 16.0	140 09.3	·· 02.0	29 57.7	·· 03.3	40 03.4	149	·14 31.1	−106
22	256 19.0	108 35.8	47.3	348 04.9	16.1	155 11.2	02.0	45 00.1	03.4	54 37.3	148	14 41.7	−105
23	271 21.4	123 35.4	46.2	3 08.1	16.1	170 13.0	02.0	60 02.6	03.4	69 11.1	148	14 52.2	−104
24	286 23.9	138 35.1	+14 45.2	18 11.3	−28 16.2	185 14.9	+23 01.9	75 05.0	−10 03.4	83 44.9	148	−15 02.6	−103
code	—	− 3	− 10	+ 32	0	+ 18	0	+ 25	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
6 0	178 53.2	+22 46.3
1	193 53.1	46.0
2	208 52.9	45.8
3	223 52.8	·· 45.5
4	238 52.7	45.3
5	253 52.6	45.1
6	268 52.5	+22 44.8
7	283 52.4	44.6
8	298 52.3	44.3
9	313 52.2	·· 44.1
10	328 52.1	43.8
11	343 52.0	43.6
12	358 51.9	+22 43.3
13	13 51.8	43.1
14	28 51.7	42.9
15	43 51.6	·· 42.6
16	58 51.4	42.4
17	73 51.3	42.1
18	88 51.2	+22 41.9
19	103 51.1	41.6
20	118 51.0	41.4
21	133 50.9	·· 41.1
22	148 50.8	40.8
23	163 50.7	40.6
7 0	178 50.6	+22 40.3
1	193 50.5	40.1
2	208 50.4	39.8
3	223 50.3	·· 39.6
4	238 50.2	39.3
5	253 50.1	39.1
6	268 50.0	+22 38.8
7	283 49.9	38.5
8	298 49.8	38.3
9	313 49.7	·· 38.0
10	328 49.6	37.8
11	343 49.5	37.5
12	358 49.4	+22 37.2
13	13 49.3	37.0
14	28 49.2	36.7
15	43 49.1	·· 36.4
16	58 49.0	36.2
17	73 48.9	35.9
18	88 48.8	+22 35.6
19	103 48.7	35.4
20	118 48.5	35.1
21	133 48.4	·· 34.8
22	148 48.3	34.6
23	163 48.2	34.3
8 0	178 48.1	+22 34.0
1	193 48.0	33.8
2	208 47.9	33.5
3	223 47.8	·· 33.2
4	238 47.7	32.9
5	253 47.6	32.7
6	268 47.5	+22 32.4
7	283 47.4	32.1
8	298 47.3	31.8
9	313 47.2	·· 31.6
10	328 47.1	31.3
11	343 47.1	31.0
12	358 47.0	+22 30.7
13	13 46.9	30.4
14	28 46.8	30.2
15	43 46.7	·· 29.9
16	58 46.6	29.6
17	73 46.5	29.3
18	88 46.4	+22 29.0
19	103 46.3	28.8
20	118 46.2	28.5
21	133 46.1	·· 28.2
22	148 46.0	27.9
23	163 45.9	27.6
24	178 45.8	+22 27.3
code	—	− 2

STARS

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 52.0	−40 28.8
5	Achernar	335 59.5	−57 27.6
30	Acrux	173 59.0	−62 51.2
19	Adhara	255 47.6	−28 54.5
10	Aldebaran	291 40.4	+16 25.2
32	Alioth	166 59.2	+56 12.6
34	Alkaid	153 33.4	+49 32.5
55	Al Na'ir	28 38.7	−47 10.6
15	Alnilam	276 31.5	− 1 13.7
25	Alphard	218 39.8	− 8 27.7
41	Alphecca	126 48.1	+26 52.1
1	Alpheratz	358 29.2	+28 50.3
51	Altair	62 51.0	+ 8 44.9
2	Ankaa	353 59.1	−42 32.8
42	Antares	113 20.2	−26 20.1
37	Arcturus	146 35.9	+19 25.1
43	Atria	109 01.3	−68 57.1
22	Avior	234 36.8	−59 21.9
13	Bellatrix	279 19.7	+ 6 18.7
16	Betelg'se	271 49.4	+ 7 24.1
17	Canopus	264 16.3	−52 40.1
12	Capella	281 40.2	+45 57.2
53	Deneb	50 01.2	+45 07.0
28	Denebola	183 18.7	+14 49.6
4	Diphda	349 40.1	−18 13.9
27	Dubhe	194 45.9	+62 00.0
14	Elnath	279 08.8	+28 34.3
47	Eltanin	91 06.1	+51 29.7
54	Enif	34 30.2	+ 9 40.0
56	Fomalhaut	16 12.4	−29 51.6
31	Gacrux	172 50.4	−56 51.9
29	Gienah	176 37.9	−17 17.5
35	Hadar	149 50.6	−60 09.7
6	Hamal	328 50.8	+23 14.9
48	Kaus Aust.	84 42.0	−34 24.5
40	Kochab	137 17.1	+74 20.7
57	Markab	14 22.2	+14 57.7
8	Menkar	315 01.4	+ 3 54.9
36	Menkent	148 59.6	−36 09.1
24	Miapl'dus	221 50.1	−69 32.0
9	Mirfak	309 44.0	+49 42.0
50	Nunki	76 52.6	−26 21.3
52	Peacock	54 28.1	−56 52.8
21	Pollux	244 22.0	+28 08.3
20	Procyon	245 46.3	+ 5 20.6
46	R'alhague	96 47.1	+12 35.5
26	Regulus	208 30.7	+12 11.4
11	Rigel	281 54.8	− 8 15.1
38	Rigil Kent.	140 52.0	−60 39.3
44	Sabik	103 02.9	−15 40.3
3	Schedar	350 31.0	+56 17.2
45	Shaula	97 21.5	−37 04.4
18	Sirius	259 13.0	−16 39.1
33	Spica	159 17.8	−10 55.6
23	Suhail	223 25.4	−43 15.0
49	Vega	81 08.4	+38 44.5
39	Zub'g'bi	137 54.2	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 6	Moonrise 7	Moonrise 8	Moonrise 9
N °	h m	h m	h m	h m	h m	h m
72	▭	▭	11 22	13 17	15 23	■
70	▭	▭	11 17	13 03	14 55	17 07
68	▭	▭	11 14	12 52	14 34	16 25
66	0 55	////	11 11	12 43	14 18	15 57
64	1 52	////	11 08	12 36	14 04	15 36
62	2 25	////	11 06	12 29	13 53	15 19
60	2 49	////	11 04	12 24	13 44	15 05
58	3 08	////	11 02	12 19	13 36	14 54
56	3 23	////	11 00	12 15	13 29	14 43
54	3 37	////	10 59	12 11	13 22	14 34
52	3 49	////	10 58	12 07	13 17	14 26
50	3 59	////	10 57	12 04	13 11	14 19
45	4 20	1 52	10 54	11 57	13 00	14 03
40	4 38	2 36	10 52	11 52	12 51	13 51
35	4 52	3 07	10 50	11 47	12 43	13 40
30	5 05	3 29	10 49	11 43	12 36	13 31
20	5 26	4 03	10 46	11 35	12 25	13 15
10	5 44	4 27	10 44	11 29	12 14	13 01
0	6 01	4 46	10 42	11 23	12 05	12 48
10	6 18	5 03	10 40	11 17	11 55	12 35
20	6 36	5 18	10 37	11 11	11 45	12 22
30	6 56	5 31	10 35	11 04	11 34	12 06
35	7 08	5 38	10 33	11 00	11 27	11 57
40	7 22	5 45	10 32	10 55	11 20	11 47
45	7 38	5 52	10 30	10 50	11 11	11 35
50	7 58	6 00	10 28	10 44	11 01	11 21
52	8 07	6 03	10 27	10 41	10 56	11 14
54	8 18	6 06	10 26	10 38	10 51	11 07
56	8 29	6 10	10 24	10 34	10 45	10 58
58	8 43	6 13	10 23	10 30	10 39	10 49
60 S	8 59	6 18	10 22	10 26	10 31	10 38

Lat.	Sunset	Twlt. ends	Moonset 6	Moonset 7	Moonset 8	Moonset 9
N °	h m	h m	h m	h m	h m	h m
72	▭	▭	21 52	21 25	20 47	■
70	▭	▭	22 00	21 41	21 16	20 35
68	▭	▭	22 06	21 53	21 38	21 18
66	23 10	////	22 11	22 04	21 56	21 47
64	22 15	////	22 15	22 13	22 10	22 09
62	21 43	////	22 19	22 20	22 22	22 26
60	21 20	////	22 22	22 27	22 33	22 41
58	21 01	////	22 25	22 33	22 42	22 54
56	20 45	////	22 28	22 38	22 50	23 05
54	20 32	////	22 30	22 43	22 57	23 14
52	20 20	////	22 32	22 47	23 03	23 23
50	20 10	////	22 34	22 51	23 09	23 31
45	19 49	22 16	22 39	22 59	23 21	23 47
40	19 32	21 32	22 42	23 06	23 32	24 01
35	19 17	21 02	22 46	23 12	23 41	24 12
30	19 05	20 40	22 48	23 18	23 49	24 22
20	18 44	20 07	22 53	23 27	24 02	0 02
10	18 25	19 42	22 57	23 35	24 14	0 14
0	18 08	19 23	23 02	23 43	24 25	0 25
10	17 52	19 07	23 06	23 51	24 37	0 37
20	17 34	18 52	23 10	23 59	24 49	0 49
30	17 14	18 39	23 15	24 09	0 09	1 03
35	17 02	18 32	23 18	24 14	0 14	1 11
40	16 48	18 25	23 21	24 20	0 20	1 20
45	16 32	18 18	23 25	24 28	0 28	1 31
50	16 13	18 11	23 29	24 36	0 36	1 44
52	16 03	18 07	23 31	24 41	0 41	1 50
54	15 53	18 05	23 34	24 45	0 45	1 57
56	15 41	18 01	23 36	24 50	0 50	2 04
58	15 27	17 57	23 39	24 56	0 56	2 13
60 S	15 11	17 54	23 42	25 02	1 02	2 23

Equation of Time (App.—Mean)

GMT	6	7	8
h	m s	m s	m s
0	− 4 27.2	− 4 37.4	− 4 47.2
6	− 4 29.7	− 4 39.9	− 4 49.6
12	− 4 32.3	− 4 42.3	− 4 52.0
18	− 4 34.8	− 4 44.8	− 4 54.3
24	− 4 37.4	− 4 47.2	− 4 56.7

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
6	16 52	14 44	22 58	11 46	19 08
7	17 33	14 45	22 53	11 44	19 04
8	18 15	14 46	22 48	11 41	19 01
9	18 59	14 46	22 42	11 38	18 57

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.1	0.1	0.3
30	0.1	0.1	0.3
45	0.1	0.1	0.2
60	0.1	0.0	0.1
75	0.1	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	6	7	8
°	′	′	′
0	12.9	12.4	12.1
4	12.9	12.4	12.1
8	12.9	12.4	12.2
12	12.9	12.4	12.2
16	13.0	12.5	12.2
20	13.0	12.6	12.3
24	13.1	12.6	12.4
28	13.2	12.7	12.5
32	13.2	12.8	12.6
36	13.3	12.9	12.7
40	13.4	13.0	12.8
44	13.5	13.1	12.9
48	13.6	13.3	13.1
52	13.7	13.4	13.2
56	13.9	13.5	13.4
60	14.0	13.7	13.5
64	14.1	13.9	13.7
68	14.3	14.0	13.9
72	14.4	14.2	14.1
76	14.5	14.4	14.3
80	14.7	14.5	14.4
84	14.8	14.7	14.6
88	14.9	14.8	14.8
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	6	7	8
°	′	′	′
0	17.1	17.4	17.5
4	17.1	17.4	17.5
8	17.0	17.3	17.5
12	17.0	17.3	17.4
16	17.0	17.2	17.4
20	16.9	17.2	17.3
24	16.9	17.1	17.2
28	16.8	17.0	17.2
32	16.7	16.9	17.1
36	16.6	16.8	16.9
40	16.5	16.7	16.8
44	16.4	16.6	16.7
48	16.3	16.5	16.6
52	16.2	16.3	16.4
56	16.1	16.2	16.2
60	16.0	16.0	16.1
64	15.8	15.9	15.9
68	15.7	15.7	15.7
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.3	15.2	15.2
84	15.1	15.0	15.0
88	15.0	14.9	14.9
90			

Subtract from table, back cover

First Quarter 8

992941°—53——8

GMT		♈ GHA	VENUS −3.5 GHA	VENUS Dec.	MARS −2.1 GHA	MARS Dec.	JUPITER −1.4 GHA	JUPITER Dec.	SATURN 0.8 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
9	0	286 23.9	138 35.1	+14 45.2	18 11.3	−28 16.2	185 14.9	+23 01.9	75 05.0	−10 03.4	83 44.9	148	−15 02.6	−103
	1	301 26.3	153 34.8	44.2	33 14.5	16.2	200 16.7	01.9	90 07.5	03.4	98 18.7	147	15 12.9	−103
	2	316 28.8	168 34.4	43.1	48 17.7	16.3	215 18.6	01.8	105 10.0	03.4	112 52.4	146	15 23.2	−103
	3	331 31.3	183 34.1	·· 42.1	63 20.8	·· 16.3	230 20.4	·· 01.8	120 12.4	·· 03.4	127 26.0	146	·15 33.5	−102
	4	346 33.7	198 33.8	41.0	78 24.0	16.4	245 22.3	01.8	135 14.9	03.4	141 59.6	146	15 43.7	−101
	5	1 36.2	213 33.5	40.0	93 27.2	16.4	260 24.1	01.7	150 17.3	03.5	156 33.2	145	15 53.8	−100
	6	16 38.7	228 33.1	+14 38.9	108 30.4	−28 16.5	275 26.0	+23 01.7	165 19.8	−10 03.5	171 06.7	145	−16 03.8	−100
	7	31 41.1	243 32.8	37.9	123 33.6	16.5	290 27.8	01.6	180 22.2	03.5	185 40.2	144	16 13.8	−99
	8	46 43.6	258 32.5	36.8	138 36.8	16.6	305 29.7	01.6	195 24.7	03.5	200 13.6	144	16 23.7	−99
	9	61 46.1	273 32.2	·· 35.8	153 39.9	·· 16.6	320 31.5	·· 01.6	210 27.2	·· 03.5	214 47.0	143	·16 33.6	−98
	10	76 48.5	288 31.8	34.7	168 43.1	16.7	335 33.4	01.5	225 29.6	03.5	229 20.3	142	16 43.4	−97
	11	91 51.0	303 31.5	33.7	183 46.3	16.7	350 35.3	01.5	240 32.1	03.5	243 53.5	142	16 53.1	−96
	12	106 53.5	318 31.2	+14 32.6	198 49.5	−28 16.8	5 37.1	+23 01.4	255 34.5	−10 03.6	258 26.7	142	−17 02.7	−96
	13	121 55.9	333 30.9	31.6	213 52.7	16.8	20 39.0	01.4	270 37.0	03.6	272 59.9	141	17 12.3	−95
	14	136 58.4	348 30.5	30.5	228 55.8	16.9	35 40.8	01.4	285 39.5	03.6	287 33.0	140	17 21.8	−95
	15	152 00.8	3 30.2	·· 29.5	243 59.0	·· 17.0	50 42.7	·· 01.3	300 41.9	·· 03.6	302 06.0	140	·17 31.3	−93
	16	167 03.3	18 29.9	28.4	259 02.2	17.0	65 44.5	01.3	315 44.4	03.6	316 39.0	140	17 40.6	−93
	17	182 05.8	33 29.6	27.4	274 05.4	17.0	80 46.4	01.2	330 46.8	03.6	331 12.0	139	17 49.9	−93
	18	197 08.2	48 29.3	+14 26.3	289 08.5	−28 17.1	95 48.2	+23 01.2	345 49.3	−10 03.6	345 44.9	138	−17 59.2	−91
	19	212 10.7	63 28.9	25.3	304 11.7	17.1	110 50.1	01.2	0 51.7	03.7	0 17.7	138	18 08.3	−91
	20	227 13.2	78 28.6	24.2	319 14.9	17.2	125 51.9	01.1	15 54.2	03.7	14 50.5	137	18 17.4	−90
	21	242 15.6	93 28.3	·· 23.2	334 18.0	·· 17.2	140 53.8	·· 01.1	30 56.6	·· 03.7	29 23.2	136	·18 26.4	−89
	22	257 18.1	108 28.0	22.1	349 21.2	17.3	155 55.6	01.0	45 59.1	03.7	43 55.8	137	18 35.3	−89
	23	272 20.6	123 27.7	21.1	4 24.4	17.3	170 57.5	01.0	61 01.6	03.7	58 28.5	135	18 44.2	−87
10	0	287 23.0	138 27.4	+14 20.0	19 27.5	−28 17.4	185 59.3	+23 01.0	76 04.0	−10 03.7	73 01.0	135	−18 52.9	−87
	1	302 25.5	153 27.1	18.9	34 30.7	17.4	201 01.2	00.9	91 06.5	03.8	87 33.5	134	19 01.6	−87
	2	317 27.9	168 26.7	17.9	49 33.9	17.5	216 03.0	00.9	106 08.9	03.8	102 05.9	134	19 10.3	−85
	3	332 30.4	183 26.4	·· 16.8	64 37.0	·· 17.5	231 04.9	·· 00.8	121 11.4	·· 03.8	116 38.3	133	·19 18.8	−85
	4	347 32.9	198 26.1	15.8	79 40.2	17.6	246 06.7	00.8	136 13.8	03.8	131 10.6	132	19 27.3	−83
	5	2 35.3	213 25.8	14.7	94 43.3	17.6	261 08.6	00.8	151 16.3	03.8	145 42.8	132	19 35.6	−83
	6	17 37.8	228 25.5	+14 13.7	109 46.5	−28 17.7	276 10.4	+23 00.7	166 18.7	−10 03.8	160 15.0	131	−19 43.9	−82
	7	32 40.3	243 25.2	12.6	124 49.7	17.7	291 12.3	00.7	181 21.2	03.8	174 47.1	131	19 52.1	−82
	8	47 42.7	258 24.9	11.5	139 52.8	17.8	306 14.1	00.6	196 23.6	03.9	189 19.2	130	20 00.3	−80
	9	62 45.2	273 24.6	·· 10.5	154 56.0	·· 17.8	321 16.0	·· 00.6	211 26.1	·· 03.9	203 51.2	129	·20 08.3	−80
	10	77 47.7	288 24.2	09.4	169 59.1	17.9	336 17.8	00.6	226 28.5	03.9	218 23.1	129	20 16.3	−78
	11	92 50.1	303 23.9	08.3	185 02.3	17.9	351 19.7	00.5	241 31.0	03.9	232 55.0	128	20 24.1	−78
	12	107 52.6	318 23.6	+14 07.3	200 05.4	−28 17.9	6 21.5	+23 00.5	256 33.5	−10 03.9	247 26.8	128	−20 31.9	−77
	13	122 55.1	333 23.3	06.2	215 08.6	18.0	21 23.4	00.4	271 35.9	03.9	261 58.6	127	20 39.6	−76
	14	137 57.5	348 23.0	05.2	230 11.7	18.0	36 25.3	00.4	286 38.4	04.0	276 30.3	126	20 47.2	−76
	15	153 00.0	3 22.7	·· 04.1	245 14.9	·· 18.1	51 27.1	·· 00.3	301 40.8	·· 04.0	291 01.9	126	·20 54.8	−74
	16	168 02.4	18 22.4	03.0	260 18.0	18.1	66 29.0	00.3	316 43.3	04.0	305 33.5	125	21 02.2	−73
	17	183 04.9	33 22.1	02.0	275 21.2	18.2	81 30.8	00.3	331 45.7	04.0	320 05.0	124	21 09.5	−73
	18	198 07.4	48 21.8	+14 00.9	290 24.3	−28 18.2	96 32.7	+23 00.2	346 48.2	−10 04.0	334 36.4	124	−21 16.8	−72
	19	213 09.8	63 21.5	13 59.8	305 27.4	18.2	111 34.5	00.2	1 50.6	04.0	349 07.8	123	21 24.0	−70
	20	228 12.3	78 21.2	58.8	320 30.6	18.3	126 36.4	00.1	16 53.1	04.1	3 39.1	122	21 31.0	−70
	21	243 14.8	93 20.9	·· 57.7	335 33.7	·· 18.3	141 38.2	·· 00.1	31 55.5	·· 04.1	18 10.3	122	·21 38.0	−69
	22	258 17.2	108 20.6	56.6	350 36.9	18.4	156 40.1	00.1	46 58.0	04.1	32 41.5	121	21 44.9	−68
	23	273 19.7	123 20.3	55.6	5 40.0	18.4	171 41.9	00.0	62 00.4	04.1	47 12.6	121	21 51.7	−66
11	0	288 22.2	138 20.0	+13 54.5	20 43.1	−28 18.5	186 43.8	+23 00.0	77 02.9	−10 04.1	61 43.7	120	−21 58.3	−66
	1	303 24.6	153 19.7	53.4	35 46.3	18.5	201 45.6	22 59.9	92 05.3	04.1	76 14.7	119	22 04.9	−65
	2	318 27.1	168 19.4	52.3	50 49.4	18.5	216 47.5	59.9	107 07.8	04.2	90 45.6	119	22 11.4	−64
	3	333 29.6	183 19.1	·· 51.3	65 52.5	·· 18.6	231 49.3	·· 59.9	122 10.2	·· 04.2	105 16.5	118	·22 17.8	−63
	4	348 32.0	198 18.8	50.2	80 55.7	18.6	246 51.2	59.8	137 12.7	04.2	119 47.3	117	22 24.1	−62
	5	3 34.5	213 18.5	49.1	95 58.8	18.7	261 53.0	59.8	152 15.1	04.2	134 18.0	117	22 30.3	−61
	6	18 36.9	228 18.2	+13 48.1	111 01.9	−28 18.7	276 54.9	+22 59.7	167 17.6	−10 04.2	148 48.7	116	−22 36.4	−60
	7	33 39.4	243 17.9	47.0	126 05.1	18.7	291 56.7	59.7	182 20.0	04.2	163 19.3	115	22 42.4	−59
	8	48 41.9	258 17.6	45.9	141 08.2	18.8	306 58.6	59.6	197 22.5	04.3	177 49.8	115	22 48.3	−58
	9	63 44.3	273 17.3	·· 44.8	156 11.3	·· 18.8	322 00.5	·· 59.6	212 24.9	·· 04.3	192 20.3	114	·22 54.1	−57
	10	78 46.8	288 17.0	43.8	171 14.4	18.9	337 02.3	59.6	227 27.4	04.3	206 50.7	114	22 59.8	−56
	11	93 49.3	303 16.7	42.7	186 17.6	18.9	352 04.2	59.5	242 29.8	04.3	221 21.1	113	23 05.4	−55
	12	108 51.7	318 16.4	+13 41.6	201 20.7	−28 18.9	7 06.0	+22 59.5	257 32.3	−10 04.3	235 51.4	112	−23 10.9	−53
	13	123 54.2	333 16.1	40.5	216 23.8	19.0	22 07.9	59.4	272 34.7	04.3	250 21.6	112	23 16.2	−53
	14	138 56.7	348 15.8	39.4	231 26.9	19.0	37 09.7	59.4	287 37.2	04.4	264 51.8	111	23 21.5	−52
	15	153 59.1	3 15.6	·· 38.4	246 30.1	·· 19.0	52 11.6	·· 59.4	302 39.6	·· 04.4	279 21.9	110	·23 26.7	−50
	16	169 01.6	18 15.3	37.3	261 33.2	19.1	67 13.4	59.3	317 42.1	04.4	293 51.9	110	23 31.7	−49
	17	184 04.1	33 15.0	36.2	276 36.3	19.1	82 15.3	59.3	332 44.5	04.4	308 21.9	109	23 36.6	−49
	18	199 06.5	48 14.7	+13 35.1	291 39.4	−28 19.2	97 17.1	+22 59.2	347 47.0	−10 04.4	322 51.8	109	−23 41.5	−47
	19	214 09.0	63 14.4	34.0	306 42.5	19.2	112 19.0	59.2	2 49.4	04.4	337 21.7	108	23 46.2	−46
	20	229 11.4	78 14.1	33.0	321 45.6	19.2	127 20.8	59.1	17 51.9	04.5	351 51.5	108	23 50.8	−45
	21	244 13.9	93 13.8	·· 31.9	336 48.8	·· 19.3	142 22.7	·· 59.1	32 54.3	·· 04.5	6 21.3	106	·23 55.3	−44
	22	259 16.4	108 13.5	30.8	351 51.9	19.3	157 24.5	59.1	47 56.8	04.5	20 50.9	107	23 59.7	−43
	23	274 18.8	123 13.2	29.7	6 55.0	19.3	172 26.4	59.0	62 59.2	04.5	35 20.6	105	24 04.0	−41
	24	289 21.3	138 13.0	+13 28.6	21 58.1	−28 19.4	187 28.3	+22 59.0	78 01.7	−10 04.5	49 50.1	105	−24 08.1	−41
code		—	− 3	− 11	+ 32	− 1	+ 19	− 1	+ 24	0				

GMT		SUN GHA		SUN Dec.
d	h	° ′		° ′
9	0	178 45.8	+22	27.3
	1	193 45.7		27.0
	2	208 45.6		26.8
	3	223 45.5	••	26.5
	4	238 45.4		26.2
	5	253 45.3		25.9
	6	268 45.2	+22	25.6
	7	283 45.1		25.3
	8	298 45.0		25.0
	9	313 44.9	••	24.7
	10	328 44.8		24.4
	11	343 44.7		24.1
	12	358 44.6	+22	23.8
	13	13 44.6		23.5
	14	28 44.5		23.2
	15	43 44.4	••	22.9
	16	58 44.3		22.6
	17	73 44.2		22.3
	18	88 44.1	+22	22.1
	19	103 44.0		21.8
	20	118 43.9		21.5
	21	133 43.8	••	21.1
	22	148 43.7		20.8
	23	163 43.6		20.5
10	0	178 43.5	+22	20.2
	1	193 43.4		19.9
	2	208 43.3		19.6
	3	223 43.3	••	19.3
	4	238 43.2		19.0
	5	253 43.1		18.7
	6	268 43.0	+22	18.4
	7	283 42.9		18.1
	8	298 42.8		17.8
	9	313 42.7	••	17.5
	10	328 42.6		17.2
	11	343 42.5		16.9
	12	358 42.4	+22	16.6
	13	13 42.4		16.2
	14	28 42.3		15.9
	15	43 42.2	••	15.6
	16	58 42.1		15.3
	17	73 42.0		15.0
	18	88 41.9	+22	14.7
	19	103 41.8		14.4
	20	118 41.7		14.0
	21	133 41.6	••	13.7
	22	148 41.6		13.4
	23	163 41.5		13.1
11	0	178 41.4	+22	12.8
	1	193 41.3		12.4
	2	208 41.2		12.1
	3	223 41.1	••	11.8
	4	238 41.0		11.5
	5	253 41.0		11.2
	6	268 40.9	+22	10.8
	7	283 40.8		10.5
	8	298 40.7		10.2
	9	313 40.6	••	09.9
	10	328 40.5		09.5
	11	343 40.4		09.2
	12	358 40.4	+22	08.9
	13	13 40.3		08.6
	14	28 40.2		08.2
	15	43 40.1	••	07.9
	16	58 40.0		07.6
	17	73 39.9		07.2
	18	88 39.8	+22	06.9
	19	103 39.8		06.6
	20	118 39.7		06.3
	21	133 39.6	••	05.9
	22	148 39.5		05.6
	23	163 39.4		05.2
	24	178 39.3	+22	04.9
code		—		– 4

STARS

No.	Name	SHA ° ′	Dec. ° ′
7	Acamar	315 52.0	−40 28.8
5	Achernar	335 59.5	−57 27.6
30	Acrux	173 59.1	−62 51.2
19	Adhara	255 47.6	−28 54.5
10	Aldebaran	291 40.4	+16 25.2
32	Alioth	166 59.3	+56 12.6
34	Alkaid	153 33.4	+49 32.5
55	Al Na'ir	28 38.6	−47 10.6
15	Alnilam	276 31.5	− 1 13.7
25	Alphard	218 39.8	− 8 27.7
41	Alphecca	126 48.1	+26 52.1
1	Alpheratz	358 29.2	+28 50.4
51	Altair	62 51.0	+ 8 44.9
2	Ankaa	353 59.0	−42 32.8
42	Antares	113 20.2	−26 20.1
37	Arcturus	146 35.9	+19 25.1
43	Atria	109 01.3	−68 57.1
22	Avior	234 36.8	−59 21.9
13	Bellatrix	279 19.7	+ 6 18.7
16	Betelg'se	271 49.4	+ 7 24.1
17	Canopus	264 16.3	−52 40.1
12	Capella	281 40.2	+45 57.2
53	Deneb	50 01.2	+45 07.0
28	Denebola	183 18.7	+14 49.6
4	Diphda	349 40.1	−18 13.9
27	Dubhe	194 45.9	+62 00.0
14	Elnath	279 08.8	+28 34.3
47	Eltanin	91 06.1	+51 29.7
54	Enif	34 30.2	+ 9 40.0
56	Fomalhaut	16 12.3	−29 51.5
31	Gacrux	172 50.4	−56 51.9
29	Gienah	176 37.9	−17 17.5
35	Hadar	149 50.6	−60 09.7
6	Hamal	328 50.8	+23 14.9
48	Kaus Aust.	84 42.0	−34 24.5
40	Kochab	137 17.2	+74 20.7
57	Markab	14 22.2	+14 57.7
8	Menkar	315 01.4	+ 3 54.9
36	Menkent	148 59.7	−36 09.1
24	Miapl'dus	221 50.2	−69 32.0
9	Mirfak	309 44.0	+49 42.0
50	Nunki	76 52.6	−26 21.3
52	Peacock	54 28.0	−56 52.8
21	Pollux	244 22.0	+28 08.3
20	Procyon	245 46.3	+ 5 20.6
46	R'alhague	96 47.1	+12 35.5
26	Regulus	208 30.7	+12 11.4
11	Rigel	281 54.8	− 8 15.0
38	Rigil Kent.	140 52.0	−60 39.4
44	Sabik	103 02.9	−15 40.3
3	Schedar	350 31.0	+56 17.2
45	Shaula	97 21.5	−37 04.5
18	Sirius	259 13.0	−16 39.1
33	Spica	159 17.8	−10 55.6
23	Suhail	223 25.4	−43 15.0
49	Vega	81 08.4	+38 44.5
39	Zub'g'bi	137 54.2	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 9	Moonrise 10	Moonrise 11	Moonrise 12
N °	h m	h m	h m	h m	h m	h m
72	□	□	■	■	■	■
70	□	□	17 07	■	■	■
68	□	□	16 25	18 50	■	■
66	1 10	////	15 57	17 47	■	■
64	2 00	////	15 36	17 12	18 51	20 22
62	2 31	////	15 19	16 47	18 13	19 30
60	2 53	////	15 05	16 27	17 47	18 58
58	3 12	////	14 54	16 11	17 27	18 34
56	3 27	////	14 43	15 58	17 10	18 15
54	3 40	////	14 34	15 46	16 55	17 59
52	3 52	////	14 26	15 35	16 43	17 45
50	4 02	////	14 19	15 26	16 32	17 33
45	4 23	1 57	14 03	15 07	16 09	17 08
40	4 40	2 39	13 51	14 51	15 50	16 48
35	4 54	3 08	13 40	14 38	15 35	16 32
30	5 06	3 31	13 31	14 26	15 22	16 17
20	5 27	4 04	13 15	14 06	14 59	15 53
10	5 45	4 28	13 01	13 49	14 40	15 32
0	6 02	4 46	12 48	13 34	14 22	15 12
10	6 18	5 03	12 35	13 18	14 04	14 53
20	6 36	5 18	12 22	13 01	13 44	14 32
30	6 56	5 31	12 06	12 42	13 22	14 08
35	7 07	5 38	11 57	12 31	13 09	13 54
40	7 21	5 44	11 47	12 18	12 54	13 38
45	7 36	5 51	11 35	12 03	12 37	13 18
50	7 56	5 59	11 21	11 45	12 15	12 54
52	8 05	6 02	11 14	11 36	12 05	12 42
54	8 15	6 05	11 07	11 26	11 53	12 29
56	8 27	6 08	10 58	11 16	11 40	12 14
58	8 40	6 11	10 49	11 03	11 24	11 56
60	8 56	6 15	10 38	10 49	11 06	11 33
S						

Lat.	Sunset	Twlt. ends	Moonset 9	Moonset 10	Moonset 11	Moonset 12
N °	h m	h m	h m	h m	h m	h m
72	□	□	■	■	■	■
70	□	□	20 35	■	■	■
68	□	□	21 18	20 29	■	■
66	22 57	////	21 47	21 33	■	■
64	22 09	////	22 09	22 08	22 11	22 26
62	21 38	////	22 26	22 34	22 48	23 18
60	21 16	////	22 41	22 54	23 15	23 50
58	20 58	////	22 54	23 11	23 36	24 14
56	20 43	////	23 05	23 25	23 53	24 33
54	20 30	////	23 14	23 37	24 08	0 08
52	20 18	////	23 23	23 48	24 20	0 20
50	20 08	////	23 31	23 57	24 32	0 32
45	19 47	22 12	23 47	24 18	0 18	0 55
40	19 30	21 29	24 01	0 01	0 34	1 14
35	19 16	21 00	24 12	0 12	0 48	1 30
30	19 04	20 39	24 22	0 22	1 00	1 43
20	18 43	20 06	0 02	0 40	1 21	2 07
10	18 25	19 42	0 14	0 55	1 39	2 27
0	18 09	19 23	0 25	1 10	1 56	2 46
10	17 53	19 08	0 37	1 24	2 14	3 05
20	17 35	18 53	0 49	1 40	2 32	3 25
30	17 15	18 40	1 03	1 57	2 53	3 49
35	17 03	18 33	1 11	2 08	3 05	4 02
40	16 50	18 27	1 20	2 20	3 20	4 18
45	16 34	18 20	1 31	2 34	3 37	4 38
50	16 15	18 13	1 44	2 51	3 58	5 01
52	16 06	18 10	1 50	2 59	4 08	5 13
54	15 56	18 07	1 57	3 08	4 19	5 26
56	15 44	18 03	2 04	3 19	4 32	5 41
58	15 31	18 00	2 13	3 31	4 47	5 59
60	15 15	17 56	2 23	3 44	5 05	6 21
S						

Equation of Time (App.—Mean)

GMT h	9 m s	10 m s	11 m s
0	− 4 56.7	− 5 05.7	− 5 14.3
6	− 4 59.0	− 5 07.9	− 5 16.4
12	− 5 01.2	− 5 10.0	− 5 18.4
18	− 5 03.5	− 5 12.2	− 5 20.4
24	− 5 05.7	− 5 14.3	− 5 22.4

GMT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
9	18 59	14 46	22 42	11 38	18 57
10	19 45	14 47	22 37	11 35	18 53
11	20 34	14 47	22 32	11 32	18 49
12	21 25	14 47	22 28	11 29	18 45

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0			
	0.1	0.1	0.3
30			
	0.1	0.1	0.3
45			
	0.1	0.1	0.2
60			
	0.1	0.0	0.1
75			
	0.1	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt. °	9 ′	10 ′	11 ′
0			
	12.0	12.1	12.5
4			
	12.0	12.1	12.5
8			
	12.0	12.2	12.5
12			
	12.1	12.2	12.6
16			
	12.1	12.2	12.6
20			
	12.2	12.3	12.7
24			
	12.3	12.4	12.7
28			
	12.4	12.5	12.8
32			
	12.5	12.6	12.9
36			
	12.6	12.7	13.0
40			
	12.7	12.8	13.1
44			
	12.8	12.9	13.2
48			
	13.0	13.1	13.4
52			
	13.1	13.2	13.5
56			
	13.3	13.4	13.6
60			
	13.5	13.5	13.8
64			
	13.6	13.7	13.9
68			
	13.8	13.9	14.1
72			
	14.0	14.1	14.2
76			
	14.2	14.3	14.4
80			
	14.4	14.4	14.6
84			
	14.6	14.6	14.7
88			
	14.7	14.8	14.9
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt. °	9 ′	10 ′	11 ′
0			
	17.6	17.5	17.3
4			
	17.6	17.5	17.3
8			
	17.5	17.5	17.3
12			
	17.5	17.4	17.2
16			
	17.5	17.4	17.2
20			
	17.4	17.3	17.1
24			
	17.3	17.2	17.1
28			
	17.2	17.2	17.0
32			
	17.1	17.1	16.9
36			
	17.0	16.9	16.8
40			
	16.9	16.8	16.7
44			
	16.7	16.7	16.6
48			
	16.6	16.6	16.4
52			
	16.4	16.4	16.3
56			
	16.3	16.2	16.2
60			
	16.1	16.1	16.0
64			
	15.9	15.9	15.9
68			
	15.7	15.7	15.7
72			
	15.6	15.6	15.6
76			
	15.4	15.4	15.4
80			
	15.2	15.2	15.2
84			
	15.0	15.0	15.1
88			
	14.8	14.9	14.9
90			

Subtract from table, back cover

GMT		♈ GHA	VENUS −3.5 GHA	VENUS Dec.	MARS −2.1 GHA	MARS Dec.	JUPITER −1.4 GHA	JUPITER Dec.	SATURN 0.8 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
12	0	289 21.3	138 13.0	+13 28.6	21 58.1	−28 19.4	187 28.3	+22 59.0	78 01.7	−10 04.5	49 50.1	105	−24 08.1	−41
	1	304 23.8	153 12.7	27.6	37 01.2	19.4	202 30.1	58.9	93 04.1	04.6	64 19.6	105	24 12.2	−39
	2	319 26.2	168 12.4	26.5	52 04.3	19.4	217 32.0	58.9	108 06.5	04.6	78 49.1	104	24 16.1	−38
	3	334 28.7	183 12.1	·· 25.4	67 07.4	·· 19.5	232 33.8	·· 58.8	123 09.0	·· 04.6	93 18.5	103	·24 19.9	−37
	4	349 31.2	198 11.8	24.3	82 10.5	19.5	247 35.7	58.8	138 11.4	04.6	107 47.8	103	24 23.6	−36
	5	4 33.6	213 11.5	23.2	97 13.6	19.6	262 37.5	58.8	153 13.9	04.6	122 17.1	103	24 27.2	−34
	6	19 36.1	228 11.3	+13 22.1	112 16.7	−28 19.6	277 39.4	+22 58.7	168 16.3	−10 04.6	136 46.4	102	−24 30.6	−34
	7	34 38.5	243 11.0	21.0	127 19.8	19.6	292 41.2	58.7	183 18.8	04.7	151 15.6	101	24 34.0	−32
	8	49 41.0	258 10.7	20.0	142 22.9	19.7	307 43.1	58.6	198 21.2	04.7	165 44.7	101	24 37.2	−31
	9	64 43.5	273 10.4	·· 18.9	157 26.0	·· 19.7	322 44.9	·· 58.6	213 23.7	·· 04.7	180 13.8	100	·24 40.3	−29
	10	79 45.9	288 10.1	17.8	172 29.1	19.7	337 46.8	58.5	228 26.1	04.7	194 42.8	99	24 43.2	−29
	11	94 48.4	303 09.9	16.7	187 32.2	19.8	352 48.6	58.5	243 28.6	04.7	209 11.7	100	24 46.1	−27
	12	109 50.9	318 09.6	+13 15.6	202 35.3	−28 19.8	7 50.5	+22 58.5	258 31.0	−10 04.8	223 40.7	98	−24 48.8	−26
	13	124 53.3	333 09.3	14.5	217 38.4	19.8	22 52.3	58.4	273 33.5	04.8	238 09.5	99	24 51.4	−25
	14	139 55.8	348 09.0	13.4	232 41.5	19.9	37 54.2	58.4	288 35.9	04.8	252 38.4	97	24 53.9	−24
	15	154 58.3	3 08.8	·· 12.3	247 44.6	·· 19.9	52 56.1	·· 58.3	303 38.3	·· 04.8	267 07.1	98	·24 56.3	−22
	16	170 00.7	18 08.5	11.2	262 47.7	19.9	67 57.9	58.3	318 40.8	04.8	281 35.9	97	24 58.5	−21
	17	185 03.2	33 08.2	10.1	277 50.7	19.9	82 59.8	58.3	333 43.2	04.8	296 04.6	96	25 00.6	−20
	18	200 05.7	48 07.9	+13 09.1	292 53.8	−28 20.0	98 01.6	+22 58.2	348 45.7	−10 04.9	310 33.2	96	−25 02.6	−19
	19	215 08.1	63 07.7	08.0	307 56.9	20.0	113 03.5	58.2	3 48.1	04.9	325 01.8	95	25 04.5	−17
	20	230 10.6	78 07.4	06.9	323 00.0	20.0	128 05.3	58.1	18 50.6	04.9	339 30.3	95	25 06.2	−16
	21	245 13.0	93 07.1	·· 05.8	338 03.1	·· 20.1	143 07.2	·· 58.1	33 53.0	·· 04.9	353 58.8	95	·25 07.8	−15
	22	260 15.5	108 06.8	04.7	353 06.2	20.1	158 09.0	58.0	48 55.4	04.9	8 27.3	94	25 09.3	−14
	23	275 18.0	123 06.6	03.6	8 09.2	20.1	173 10.9	58.0	63 57.9	05.0	22 55.7	94	25 10.7	−12
13	0	290 20.4	138 06.3	+13 02.5	23 12.3	−28 20.2	188 12.7	+22 57.9	79 00.3	−10 05.0	37 24.1	94	−25 11.9	−11
	1	305 22.9	153 06.0	01.4	38 15.4	20.2	203 14.6	57.9	94 02.8	05.0	51 52.5	93	25 13.0	−9
	2	320 25.4	168 05.8	13 00.3	53 18.5	20.2	218 16.4	57.9	109 05.2	05.0	66 20.8	93	25 13.9	−9
	3	335 27.8	183 05.5	·12 59.2	68 21.6	·· 20.2	233 18.3	·· 57.8	124 07.7	·· 05.0	80 49.1	92	·25 14.8	−7
	4	350 30.3	198 05.2	58.1	83 24.6	20.3	248 20.2	57.8	139 10.1	05.1	95 17.3	92	25 15.5	−6
	5	5 32.8	213 05.0	57.0	98 27.7	20.3	263 22.0	57.7	154 12.5	05.1	109 45.5	92	25 16.1	−4
	6	20 35.2	228 04.7	+12 55.9	113 30.8	−28 20.3	278 23.9	+22 57.7	169 15.0	−10 05.1	124 13.7	91	−25 16.5	−3
	7	35 37.7	243 04.4	54.8	128 33.8	20.4	293 25.7	57.6	184 17.4	05.1	138 41.8	91	25 16.8	−2
	8	50 40.2	258 04.2	53.7	143 36.9	20.4	308 27.6	57.6	199 19.9	05.1	153 09.9	91	25 17.0	0
	9	65 42.6	273 03.9	·· 52.6	158 40.0	·· 20.4	323 29.4	·· 57.6	214 22.3	·· 05.2	167 38.0	90	·25 17.0	+1
	10	80 45.1	288 03.6	51.5	173 43.0	20.4	338 31.3	57.5	229 24.8	05.2	182 06.0	90	25 16.9	+2
	11	95 47.5	303 03.4	50.4	188 46.1	20.5	353 33.1	57.5	244 27.2	05.2	196 34.0	90	25 16.7	+3
	12	110 50.0	318 03.1	+12 49.3	203 49.2	−28 20.5	8 35.0	+22 57.4	259 29.6	−10 05.2	211 02.0	90	−25 16.4	+5
	13	125 52.5	333 02.8	48.2	218 52.2	20.5	23 36.9	57.4	274 32.1	05.2	225 30.0	89	25 15.9	+7
	14	140 54.9	348 02.6	47.1	233 55.3	20.6	38 38.7	57.3	289 34.5	05.3	239 57.9	90	25 15.2	+7
	15	155 57.4	3 02.3	·· 46.0	248 58.3	·· 20.6	53 40.6	·· 57.3	304 37.0	·· 05.3	254 25.9	89	·25 14.5	+9
	16	170 59.9	18 02.0	44.9	264 01.4	20.6	68 42.4	57.3	319 39.4	05.3	268 53.8	88	25 13.6	+10
	17	186 02.3	33 01.8	43.8	279 04.5	20.6	83 44.3	57.2	334 41.8	05.3	283 21.6	89	25 12.6	+12
	18	201 04.8	48 01.5	+12 42.7	294 07.5	−28 20.7	98 46.1	+22 57.2	349 44.3	−10 05.3	297 49.5	88	−25 11.4	+13
	19	216 07.3	63 01.3	41.6	309 10.6	20.7	113 48.0	57.1	4 46.7	05.4	312 17.3	88	25 10.1	+14
	20	231 09.7	78 01.0	40.5	324 13.6	20.7	128 49.8	57.1	19 49.2	05.4	326 45.1	88	25 08.7	+16
	21	246 12.2	93 00.7	·· 39.4	339 16.7	·· 20.7	143 51.7	·· 57.0	34 51.6	·· 05.4	341 12.9	88	·25 07.1	+17
	22	261 14.7	108 00.5	38.3	354 19.7	20.8	158 53.5	57.0	49 54.0	05.4	355 40.7	88	25 05.4	+19
	23	276 17.1	123 00.2	37.1	9 22.8	20.8	173 55.4	56.9	64 56.5	05.4	10 08.5	88	25 03.5	+19
14	0	291 19.6	138 00.0	+12 36.0	24 25.8	−28 20.8	188 57.3	+22 56.9	79 58.9	−10 05.5	24 36.3	87	−25 01.6	+22
	1	306 22.0	152 59.7	34.9	39 28.9	20.8	203 59.1	56.9	95 01.4	05.5	39 04.0	87	24 59.4	+22
	2	321 24.5	167 59.5	33.8	54 31.9	20.9	219 01.0	56.8	110 03.8	05.5	53 31.7	88	24 57.2	+24
	3	336 27.0	182 59.2	·· 32.7	69 35.0	·· 20.9	234 02.8	·· 56.8	125 06.2	·· 05.5	67 59.5	87	·24 54.8	+25
	4	351 29.4	197 59.0	31.6	84 38.0	20.9	249 04.7	56.7	140 08.7	05.6	82 27.2	87	24 52.3	+27
	5	6 31.9	212 58.7	30.5	99 41.0	20.9	264 06.5	56.7	155 11.1	05.6	96 54.9	87	24 49.6	+28
	6	21 34.4	227 58.4	+12 29.4	114 44.1	−28 21.0	279 08.4	+22 56.6	170 13.6	−10 05.6	111 22.6	87	−24 46.8	+29
	7	36 36.8	242 58.2	28.3	129 47.1	21.0	294 10.2	56.6	185 16.0	05.6	125 50.3	87	24 43.9	+31
	8	51 39.3	257 57.9	27.2	144 50.2	21.0	309 12.1	56.6	200 18.4	05.6	140 18.0	87	24 40.8	+32
	9	66 41.8	272 57.7	·· 26.0	159 53.2	·· 21.0	324 14.0	·· 56.5	215 20.9	·· 05.7	154 45.7	87	·24 37.6	+33
	10	81 44.2	287 57.4	24.9	174 56.2	21.0	339 15.8	56.5	230 23.3	05.7	169 13.4	87	24 34.3	+35
	11	96 46.7	302 57.2	23.8	189 59.3	21.1	354 17.7	56.4	245 25.7	05.7	183 41.1	87	24 30.8	+36
	12	111 49.2	317 56.9	+12 22.7	205 02.3	−28 21.1	9 19.5	+22 56.4	260 28.2	−10 05.7	198 08.8	87	−24 27.2	+37
	13	126 51.6	332 56.7	21.6	220 05.3	21.1	24 21.4	56.3	275 30.6	05.7	212 36.5	87	24 23.5	+39
	14	141 54.1	347 56.4	20.5	235 08.4	21.1	39 23.2	56.3	290 33.1	05.8	227 04.2	87	24 19.6	+40
	15	156 56.5	2 56.2	·· 19.4	250 11.4	·· 21.1	54 25.1	·· 56.2	305 35.5	·· 05.8	241 31.9	87	·24 15.6	+42
	16	171 59.0	17 56.0	18.2	265 14.4	21.2	69 26.9	56.2	320 37.9	05.8	255 59.6	88	24 11.4	+43
	17	187 01.5	32 55.7	17.1	280 17.4	21.2	84 28.8	56.2	335 40.4	05.8	270 27.4	87	24 07.1	+44
	18	202 03.9	47 55.5	+12 16.0	295 20.5	−28 21.2	99 30.7	+22 56.1	350 42.8	−10 05.9	284 55.1	87	−24 02.7	+46
	19	217 06.4	62 55.2	14.9	310 23.5	21.2	114 32.5	56.1	5 45.2	05.9	299 22.8	88	23 58.1	+47
	20	232 08.9	77 55.0	13.8	325 26.5	21.3	129 34.4	56.0	20 47.7	05.9	313 50.6	87	23 53.4	+48
	21	247 11.3	92 54.7	·· 12.7	340 29.5	·· 21.3	144 36.2	·· 56.0	35 50.1	·· 05.9	328 18.3	88	·23 48.6	+50
	22	262 13.8	107 54.5	11.5	355 32.5	21.3	159 38.1	55.9	50 52.5	05.9	342 46.1	88	23 43.6	+50
	23	277 16.3	122 54.2	10.4	10 35.6	21.3	174 39.9	55.9	65 55.0	06.0	357 13.9	88	23 38.6	+53
	24	292 18.7	137 54.0	+12 09.3	25 38.6	−28 21.3	189 41.8	+22 55.8	80 57.4	−10 06.0	11 41.7	88	−23 33.3	+53
code		—	−3	−11	+30	0	+19	0	+25	0				

SUN

GMT	GHA	Dec.
h	° ′	° ′
12 0	178 39.3	+22 04.9
1	193 39.3	04.6
2	208 39.2	04.2
3	223 39.1	·· 03.9
4	238 39.0	03.6
5	253 38.9	03.2
6	268 38.9	+22 02.9
7	283 38.8	02.6
8	298 38.7	02.2
9	313 38.6	·· 01.9
10	328 38.5	01.5
11	343 38.5	01.2
12	358 38.4	+22 00.8
13	13 38.3	00.5
14	28 38.2	22 00.2
15	43 38.1	·21 59.8
16	58 38.1	59.5
17	73 38.0	59.1
18	88 37.9	+21 58.8
19	103 37.8	58.4
20	118 37.7	58.1
21	133 37.7	·· 57.7
22	148 37.6	57.4
23	163 37.5	57.0
13 0	178 37.4	+21 56.7
1	193 37.4	56.3
2	208 37.3	56.0
3	223 37.2	·· 55.6
4	238 37.1	55.3
5	253 37.0	54.9
6	268 37.0	+21 54.6
7	283 36.9	54.2
8	298 36.8	53.9
9	313 36.7	·· 53.5
10	328 36.7	53.1
11	343 36.6	52.8
12	358 36.5	+21 52.4
13	13 36.4	52.1
14	28 36.4	51.7
15	43 36.3	·· 51.3
16	58 36.2	51.0
17	73 36.1	50.6
18	88 36.1	+21 50.3
19	103 36.0	49.9
20	118 35.9	49.5
21	133 35.8	·· 49.2
22	148 35.8	48.8
23	163 35.7	48.4
14 0	178 35.6	+21 48.1
1	193 35.6	47.7
2	208 35.5	47.3
3	223 35.4	·· 47.0
4	238 35.3	46.6
5	253 35.3	46.2
6	268 35.2	+21 45.9
7	283 35.1	45.5
8	298 35.1	45.1
9	313 35.0	·· 44.8
10	328 34.9	44.4
11	343 34.8	44.0
12	358 34.8	+21 43.6
13	13 34.7	43.3
14	28 34.6	42.9
15	43 34.6	·· 42.5
16	58 34.5	42.1
17	73 34.4	41.8
18	88 34.4	+21 41.4
19	103 34.3	41.0
20	118 34.2	40.6
21	133 34.1	·· 40.2
22	148 34.1	39.9
23	163 34.0	39.5
24	178 33.9	+21 39.1
code	—	− 3

STARS

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.9	−40 28.8
5	Achernar	335 59.5	−57 27.6
30	Acrux	173 59.1	−62 51.2
19	Adhara	255 47.6	−28 54.5
10	Aldebaran	291 40.3	+16 25.2
32	Alioth	166 59.3	+56 12.6
34	Alkaid	153 33.4	+49 32.6
55	Al Na'ir	28 38.6	−47 10.6
15	Alnilam	276 31.5	− 1 13.7
25	Alphard	218 39.8	− 8 27.7
41	Alphecca	126 48.1	+26 52.1
1	Alpheratz	358 29.2	+28 50.4
51	Altair	62 51.0	+ 8 44.9
2	Ankaa	353 59.0	−42 32.8
42	Antares	113 20.2	−26 20.1
37	Arcturus	146 35.9	+19 25.1
43	Atria	109 01.3	−68 57.1
22	Avior	234 36.8	−59 21.8
13	Bellatrix	279 19.7	+ 6 18.7
16	Betelg'se	271 49.4	+ 7 24.1
17	Canopus	264 16.3	−52 40.1
12	Capella	281 40.2	+45 57.2
53	Deneb	50 01.2	+45 07.0
28	Denebola	183 18.7	+14 49.6
4	Diphda	349 40.1	−18 13.9
27	Dubhe	194 46.0	+62 00.0
14	Elnath	279 08.8	+28 34.3
47	Eltanin	91 06.1	+51 29.7
54	Enif	34 30.2	+ 9 40.0
56	Fomalhaut	16 12.3	−29 51.5
31	Gacrux	172 50.4	−56 51.9
29	Gienah	176 37.9	−17 17.5
35	Hadar	149 50.6	−60 09.7
6	Hamal	328 50.7	+23 14.9
48	Kaus Aust.	84 41.9	−34 24.5
40	Kochab	137 17.2	+74 20.7
57	Markab	14 22.1	+14 57.7
8	Menkar	315 01.4	+ 3 54.9
36	Menkent	148 59.7	−36 09.1
24	Miapl'dus	221 50.2	−69 32.0
9	Mirfak	309 44.0	+49 42.0
50	Nunki	76 52.6	−26 21.3
52	Peacock	54 28.0	−56 52.8
21	Pollux	244 22.0	+28 08.3
20	Procyon	245 46.2	+ 5 20.6
46	R'alhague	96 47.1	+12 35.5
26	Regulus	208 30.7	+12 11.4
11	Rigel	281 54.8	− 8 15.0
38	Rigil Kent.	140 52.1	−60 39.4
44	Sabik	103 02.9	−15 40.3
3	Schedar	350 31.0	+56 17.2
45	Shaula	97 21.5	−37 04.5
18	Sirius	259 13.0	−16 39.1
33	Spica	159 17.8	−10 55.6
23	Suhail	223 25.4	−43 15.0
49	Vega	81 08.4	+38 44.5
39	Zub'g'bi	137 54.2	−15 51.4

Sunrise, Twilight, Moonrise

Lat.	Sunrise	Twlt. begins	Moonrise 12	13	14	15
°	h m	h m	h m	h m	h m	h m
N 72	□	□	■	■	■	■
70	□	□	■	■	■	■
68	□	□	■	■	■	22 52
66	1 24	////	■	■	22 38	22 03
64	2 08	////	20 22	21 15	21 29	21 31
62	2 37	////	19 30	20 24	20 53	21 07
60	2 59	////	18 58	19 52	20 27	20 48
58	3 16	////	18 34	19 28	20 07	20 33
56	3 31	////	18 15	19 09	19 50	20 19
54	3 44	////	17 59	18 53	19 35	20 07
52	3 55	////	17 45	18 39	19 23	19 57
50	4 05	0 19	17 33	18 27	19 12	19 48
45	4 25	2 01	17 08	18 02	18 49	19 28
40	4 42	2 43	16 48	17 42	18 30	19 12
35	4 56	3 11	16 32	17 25	18 14	18 58
30	5 08	3 33	16 17	17 11	18 01	18 47
20	5 28	4 05	15 53	16 46	17 38	18 26
10	5 46	4 28	15 32	16 25	17 17	18 08
0	6 02	4 48	15 12	16 05	16 59	17 52
10	6 18	5 03	14 53	15 45	16 40	17 35
20	6 36	5 18	14 32	15 24	16 20	17 17
30	6 55	5 30	14 08	15 00	15 56	16 57
35	7 07	5 37	13 54	14 45	15 43	16 45
40	7 20	5 44	13 38	14 29	15 27	16 31
45	7 35	5 51	13 18	14 09	15 08	16 14
50	7 54	5 58	12 54	13 44	14 44	15 54
52	8 03	6 01	12 42	13 32	14 33	15 44
54	8 13	6 04	12 29	13 18	14 20	15 33
56	8 24	6 06	12 14	13 02	14 05	15 20
58	8 37	6 10	11 56	12 43	13 47	15 06
S 60	8 52	6 13	11 33	12 19	13 26	14 49

Sunset, Twilight, Moonset

Lat.	Sunset	Twlt. ends	Moonset 12	13	14	15
°	h m	h m	h m	h m	h m	h m
N 72	□	□	■	■	■	■
70	□	□	■	■	■	■
68	□	□	■	■	■	■
66	22 44	////	■	■	23 52	26 18
64	22 01	////	22 26	23 23	25 02	1 02
62	21 33	////	23 18	24 15	0 15	1 37
60	21 11	////	23 50	24 46	0 46	2 02
58	20 54	////	24 14	0 14	1 10	2 22
56	20 39	////	24 33	0 33	1 29	2 39
54	20 27	////	0 08	0 50	1 45	2 53
52	20 16	////	0 20	1 03	1 59	3 05
50	20 06	23 41	0 32	1 16	2 11	3 16
45	19 46	22 08	0 55	1 41	2 36	3 39
40	19 29	21 27	1 14	2 01	2 55	3 57
35	19 15	20 59	1 30	2 18	3 12	4 12
30	19 03	20 37	1 43	2 32	3 26	4 25
20	18 43	20 06	2 07	2 57	3 50	4 47
10	18 26	19 43	2 27	3 18	4 11	5 06
0	18 09	19 23	2 46	3 38	4 31	5 24
10	17 53	19 08	3 05	3 57	4 50	5 42
20	17 36	18 54	3 25	4 19	5 11	6 01
30	17 17	18 41	3 49	4 43	5 35	6 23
35	17 05	18 35	4 02	4 58	5 49	6 36
40	16 52	18 28	4 18	5 14	6 05	6 50
45	16 37	18 22	4 38	5 34	6 24	7 08
50	16 18	18 15	5 01	5 59	6 49	7 29
52	16 09	18 12	5 13	6 11	7 00	7 39
54	15 59	18 09	5 26	6 25	7 13	7 50
56	15 48	18 06	5 41	6 41	7 28	8 03
58	15 35	18 03	5 59	7 00	7 46	8 18
S 60	15 20	18 00	6 21	7 24	8 08	8 36

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.1	0.1	0.3
30			
	0.1	0.1	0.3
45			
	0.1	0.1	0.2
60			
	0.1	0.1	0.1
75			
	0.1	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	12	13	14
°	′	′	′
0			
	13.0	13.6	14.3
4			
	13.0	13.7	14.3
8			
	13.0	13.7	14.3
12			
	13.1	13.7	14.3
16			
	13.1	13.7	14.3
20			
	13.2	13.8	14.4
24			
	13.2	13.8	14.4
28			
	13.3	13.8	14.4
32			
	13.3	13.9	14.4
36			
	13.4	14.0	14.5
40			
	13.5	14.0	14.5
44			
	13.6	14.1	14.6
48			
	13.7	14.2	14.6
52			
	13.8	14.3	14.7
56			
	13.9	14.3	14.7
60			
	14.1	14.4	14.8
64			
	14.2	14.5	14.9
68			
	14.3	14.6	14.9
72			
	14.5	14.7	15.0
76			
	14.6	14.8	15.1
80			
	14.7	14.9	15.1
84			
	14.9	15.0	15.2
88			
	15.0	15.1	15.3
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	12	13	14
°	′	′	′
0			
	17.0	16.6	16.3
4			
	17.0	16.6	16.3
8			
	17.0	16.6	16.3
12			
	16.9	16.6	16.2
16			
	16.9	16.6	16.2
20			
	16.9	16.5	16.2
24			
	16.8	16.5	16.2
28			
	16.7	16.4	16.1
32			
	16.7	16.4	16.1
36			
	16.6	16.3	16.1
40			
	16.5	16.3	16.0
44			
	16.4	16.2	16.0
48			
	16.3	16.1	15.9
52			
	16.2	16.0	15.9
56			
	16.1	15.9	15.8
60			
	15.9	15.8	15.7
64			
	15.8	15.8	15.7
68			
	15.7	15.7	15.6
72			
	15.6	15.6	15.6
76			
	15.4	15.5	15.5
80			
	15.3	15.4	15.4
84			
	15.1	15.2	15.3
88			
	15.0	15.2	15.3
90			

Subtract from table, back cover

Equation of Time (App.—Mean)

GMT	12	13	14
h	m s	m s	m s
0	− 5 22.4	− 5 30.1	− 5 37.4
6	− 5 24.4	− 5 32.0	− 5 39.1
12	− 5 26.3	− 5 33.8	− 5 40.8
18	− 5 28.2	− 5 35.6	− 5 42.4
24	− 5 30.1	− 5 37.4	− 5 44.1

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
12	21 25	14 47	22 28	11 29	18 45
13	22 18	14 48	22 23	11 26	18 41
14	23 12	14 48	22 18	11 23	18 37
15	24 04	14 49	22 13	11 20	18 33

GMT	h	♈ GHA	VENUS −3.5 GHA	VENUS Dec.	MARS −2.0 GHA	MARS Dec.	JUPITER −1.4 GHA	JUPITER Dec.	SATURN 0.8 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
15	0	292 18.7	137 54.0	+12 09.3	25 38.6	−28 21.3	189 41.8	+22 55.8	80 57.4	−10 06.0	11 41.7	88	−23 33.3	+53
	1	307 21.2	152 53.8	08.2	40 41.6	21.3	204 43.6	55.8	95 59.9	06.0	26 09.5	89	23 28.0	+55
	2	322 23.6	167 53.5	07.1	55 44.6	21.4	219 45.5	55.8	111 02.3	06.0	40 37.4	88	23 22.5	+56
	3	337 26.1	182 53.3	•• 05.9	70 47.6	•• 21.4	234 47.4	•• 55.7	126 04.7	•• 06.0	55 05.2	89	·23 16.9	+58
	4	352 28.6	197 53.0	04.8	85 50.6	21.4	249 49.2	55.7	141 07.2	06.1	69 33.1	89	23 11.1	+59
	5	7 31.0	212 52.8	03.7	100 53.6	21.4	264 51.1	55.6	156 09.6	06.1	84 01.0	89	23 05.2	+60
	6	22 33.5	227 52.6	+12 02.6	115 56.6	−28 21.4	279 52.9	+22 55.6	171 12.0	−10 06.1	98 28.9	89	−22 59.2	+62
	7	37 36.0	242 52.3	01.5	130 59.6	21.5	294 54.8	55.5	186 14.5	06.1	112 56.8	89	22 53.0	+62
	8	52 38.4	257 52.1	12 00.3	146 02.6	21.5	309 56.6	55.5	201 16.9	06.2	127 24.7	90	22 46.8	+64
	9	67 40.9	272 51.8	·11 59.2	161 05.6	•• 21.5	324 58.5	•• 55.4	216 19.3	•• 06.2	141 52.7	90	·22 40.4	+66
	10	82 43.4	287 51.6	58.1	176 08.6	21.5	340 00.4	55.4	231 21.8	06.2	156 20.7	90	22 33.8	+66
	11	97 45.8	302 51.4	57.0	191 11.6	21.5	355 02.2	55.3	246 24.2	06.2	170 48.7	91	22 27.2	+68
	12	112 48.3	317 51.1	+11 55.8	206 14.6	−28 21.5	10 04.1	+22 55.3	261 26.6	−10 06.3	185 16.8	91	−22 20.4	+69
	13	127 50.8	332 50.9	54.7	221 17.6	21.6	25 05.9	55.3	276 29.1	06.3	199 44.9	91	22 13.5	+71
	14	142 53.2	347 50.7	53.6	236 20.6	21.6	40 07.8	55.2	291 31.5	06.3	214 13.0	91	22 06.4	+72
	15	157 55.7	2 50.4	•• 52.5	251 23.6	•• 21.6	55 09.6	•• 55.2	306 33.9	•• 06.3	228 41.1	92	·21 59.2	+72
	16	172 58.1	17 50.2	51.3	266 26.6	21.6	70 11.5	55.1	321 36.4	06.3	243 09.3	91	21 52.0	+75
	17	188 00.6	32 50.0	50.2	281 29.6	21.6	85 13.3	55.1	336 38.8	06.4	257 37.4	93	21 44.5	+75
	18	203 03.1	47 49.7	+11 49.1	296 32.6	−28 21.6	100 15.2	+22 55.0	351 41.2	−10 06.4	272 05.7	92	−21 37.0	+77
	19	218 05.5	62 49.5	47.9	311 35.6	21.7	115 17.1	55.0	6 43.7	06.4	286 33.9	93	21 29.3	+78
	20	233 08.0	77 49.3	46.8	326 38.6	21.7	130 18.9	54.9	21 46.1	06.4	301 02.2	93	21 21.5	+79
	21	248 10.5	92 49.1	•• 45.7	341 41.6	•• 21.7	145 20.8	•• 54.9	36 48.5	•• 06.5	315 30.5	93	·21 13.6	+80
	22	263 12.9	107 48.8	44.6	356 44.6	21.7	160 22.6	54.8	51 51.0	06.5	329 58.8	94	21 05.6	+82
	23	278 15.4	122 48.6	43.4	11 47.5	21.7	175 24.5	54.8	66 53.4	06.5	344 27.2	94	20 57.4	+82
16	0	293 17.9	137 48.4	+11 42.3	26 50.5	−28 21.7	190 26.3	+22 54.8	81 55.8	−10 06.5	358 55.6	95	−20 49.2	+84
	1	308 20.3	152 48.1	41.2	41 53.5	21.7	205 28.2	54.7	96 58.3	06.6	13 24.1	94	20 40.8	+85
	2	323 22.8	167 47.9	40.0	56 56.5	21.8	220 30.1	54.7	112 00.7	06.6	27 52.5	96	20 32.3	+87
	3	338 25.3	182 47.7	•• 38.9	71 59.5	•• 21.8	235 31.9	•• 54.6	127 03.1	•• 06.6	42 21.1	95	·20 23.6	+87
	4	353 27.7	197 47.5	37.8	87 02.4	21.8	250 33.8	54.6	142 05.5	06.6	56 49.6	96	20 14.9	+89
	5	8 30.2	212 47.2	36.6	102 05.4	21.8	265 35.6	54.5	157 08.0	06.7	71 18.2	96	20 06.0	+89
	6	23 32.6	227 47.0	+11 35.5	117 08.4	−28 21.8	280 37.5	+22 54.5	172 10.4	−10 06.7	85 46.8	97	−19 57.1	+91
	7	38 35.1	242 46.8	34.4	132 11.4	21.8	295 39.3	54.4	187 12.8	06.7	100 15.5	96	19 48.0	+92
	8	53 37.6	257 46.6	33.2	147 14.3	21.8	310 41.2	54.4	202 15.3	06.7	114 44.1	98	19 38.8	+93
	9	68 40.0	272 46.3	•• 32.1	162 17.3	•• 21.8	325 43.1	•• 54.3	217 17.7	•• 06.7	129 12.9	97	·19 29.5	+95
	10	83 42.5	287 46.1	31.0	177 20.3	21.9	340 44.9	54.3	232 20.1	06.8	143 41.6	99	19 20.0	+95
	11	98 45.0	302 45.9	29.8	192 23.2	21.9	355 46.8	54.3	247 22.6	06.8	158 10.5	98	19 10.5	+96
	12	113 47.4	317 45.7	+11 28.7	207 26.2	−28 21.9	10 48.6	+22 54.2	262 25.0	−10 06.8	172 39.3	99	−19 00.9	+98
	13	128 49.9	332 45.5	27.6	222 29.2	21.9	25 50.5	54.2	277 27.4	06.8	187 08.2	99	18 51.1	+99
	14	143 52.4	347 45.2	26.4	237 32.1	21.9	40 52.3	54.1	292 29.8	06.9	201 37.1	100	18 41.2	+99
	15	158 54.8	2 45.0	•• 25.3	252 35.1	•• 21.9	55 54.2	•• 54.1	307 32.3	•• 06.9	216 06.1	100	·18 31.3	+101
	16	173 57.3	17 44.8	24.1	267 38.0	21.9	70 56.1	54.0	322 34.7	06.9	230 35.1	100	18 21.2	+102
	17	188 59.8	32 44.6	23.0	282 41.0	21.9	85 57.9	54.0	337 37.1	06.9	245 04.1	101	18 11.0	+103
	18	204 02.2	47 44.4	+11 21.9	297 44.0	−28 22.0	100 59.8	+22 53.9	352 39.6	−10 07.0	259 33.2	101	−18 00.7	+103
	19	219 04.7	62 44.1	20.7	312 46.9	22.0	116 01.6	53.9	7 42.0	07.0	274 02.3	102	17 50.4	+105
	20	234 07.1	77 43.9	19.6	327 49.9	22.0	131 03.5	53.8	22 44.4	07.0	288 31.5	102	17 39.9	+106
	21	249 09.6	92 43.7	•• 18.4	342 52.8	•• 22.0	146 05.4	•• 53.8	37 46.8	•• 07.0	303 00.7	102	·17 29.3	+107
	22	264 12.1	107 43.5	17.3	357 55.8	22.0	161 07.2	53.7	52 49.3	07.1	317 29.9	103	17 18.6	+108
	23	279 14.5	122 43.3	16.2	12 58.7	22.0	176 09.1	53.7	67 51.7	07.1	331 59.2	103	17 07.8	+109
17	0	294 17.0	137 43.1	+11 15.0	28 01.7	−28 22.0	191 10.9	+22 53.6	82 54.1	−10 07.1	346 28.5	103	−16 56.9	+110
	1	309 19.5	152 42.8	13.9	43 04.6	22.0	206 12.8	53.6	97 56.6	07.1	0 57.8	104	16 45.9	+111
	2	324 21.9	167 42.6	12.7	58 07.6	22.0	221 14.6	53.6	112 59.0	07.2	15 27.2	105	16 34.8	+111
	3	339 24.4	182 42.4	•• 11.6	73 10.5	•• 22.0	236 16.5	•• 53.5	128 01.4	•• 07.2	29 56.7	104	·16 23.7	+113
	4	354 26.9	197 42.2	10.5	88 13.4	22.0	251 18.4	53.5	143 03.8	07.2	44 26.1	105	16 12.4	+114
	5	9 29.3	212 42.0	09.3	103 16.4	22.1	266 20.2	53.4	158 06.3	07.2	58 55.6	106	16 01.0	+114
	6	24 31.8	227 41.8	+11 08.2	118 19.3	−28 22.1	281 22.1	+22 53.4	173 08.7	−10 07.3	73 25.2	106	−15 49.6	+116
	7	39 34.2	242 41.6	07.0	133 22.3	22.1	296 23.9	53.3	188 11.1	07.3	87 54.8	106	15 38.0	+116
	8	54 36.7	257 41.4	05.9	148 25.2	22.1	311 25.8	53.3	203 13.5	07.3	102 24.4	107	15 26.4	+117
	9	69 39.2	272 41.2	•• 04.7	163 28.1	•• 22.1	326 27.6	•• 53.2	218 16.0	•• 07.3	116 54.1	107	·15 14.7	+118
	10	84 41.6	287 40.9	03.6	178 31.1	22.1	341 29.5	53.2	233 18.4	07.4	131 23.8	107	15 02.9	+119
	11	99 44.1	302 40.7	02.4	193 34.0	22.1	356 31.4	53.1	248 20.8	07.4	145 53.5	108	14 51.0	+120
	12	114 46.6	317 40.5	+11 01.3	208 36.9	−28 22.1	11 33.2	+22 53.1	263 23.3	−10 07.4	160 23.3	108	−14 39.0	+121
	13	129 49.0	332 40.3	11 00.1	223 39.8	22.1	26 35.1	53.0	278 25.7	07.4	174 53.1	109	14 26.9	+121
	14	144 51.5	347 40.1	10 59.0	238 42.8	22.1	41 36.9	53.0	293 28.1	07.5	189 23.0	109	14 14.8	+123
	15	159 54.0	2 39.9	•• 57.9	253 45.7	•• 22.1	56 38.8	•• 52.9	308 30.5	•• 07.5	203 52.9	109	·14 02.5	+123
	16	174 56.4	17 39.7	56.7	268 48.6	22.1	71 40.7	52.9	323 33.0	07.5	218 22.8	110	13 50.2	+124
	17	189 58.9	32 39.5	55.6	283 51.6	22.1	86 42.5	52.9	338 35.4	07.5	232 52.8	110	13 37.8	+125
	18	205 01.4	47 39.3	+10 54.4	298 54.5	−28 22.2	101 44.4	+22 52.8	353 37.8	−10 07.6	247 22.8	110	−13 25.3	+125
	19	220 03.8	62 39.1	53.3	313 57.4	22.2	116 46.2	52.8	8 40.2	07.6	261 52.8	111	13 12.8	+126
	20	235 06.3	77 38.9	52.1	329 00.3	22.2	131 48.1	52.7	23 42.7	07.6	276 22.9	111	13 00.2	+127
	21	250 08.7	92 38.7	•• 51.0	344 03.2	•• 22.2	146 50.0	•• 52.7	38 45.1	•• 07.7	290 53.0	111	·12 47.5	+128
	22	265 11.2	107 38.5	49.8	359 06.1	22.2	161 51.8	52.6	53 47.5	07.7	305 23.1	112	12 34.7	+128
	23	280 13.7	122 38.3	48.7	14 09.1	22.2	176 53.7	52.6	68 49.9	07.7	319 53.3	112	12 21.9	+130
	24	295 16.1	137 38.1	+10 47.5	29 12.0	−28 22.2	191 55.5	+22 52.5	83 52.3	−10 07.7	334 23.5	112	−12 08.9	+130
	code	—	−2	−11	+30	0	+19	0	+24	0				

GMT		SUN GHA	SUN Dec.
	h	° ′	° ′
15	0	178 33.9	+21 39.1
	1	193 33.9	38.7
	2	208 33.8	38.3
	3	223 33.7	•• 37.9
	4	238 33.7	37.6
	5	253 33.6	37.2
	6	268 33.5	+21 36.8
	7	283 33.5	36.4
	8	298 33.4	36.0
	9	313 33.3	•• 35.6
	10	328 33.3	35.2
	11	343 33.2	34.9
	12	358 33.2	+21 34.5
	13	13 33.1	34.1
	14	28 33.0	33.7
	15	43 33.0	•• 33.3
	16	58 32.9	32.9
	17	73 32.8	32.5
	18	88 32.8	+21 32.1
	19	103 32.7	31.7
	20	118 32.6	31.3
	21	133 32.6	•• 30.9
	22	148 32.5	30.5
	23	163 32.5	30.1
16	0	178 32.4	+21 29.7
	1	193 32.3	29.4
	2	208 32.3	29.0
	3	223 32.2	•• 28.6
	4	238 32.1	28.2
	5	253 32.1	27.8
	6	268 32.0	+21 27.4
	7	283 32.0	27.0
	8	298 31.9	26.6
	9	313 31.8	•• 26.1
	10	328 31.8	25.7
	11	343 31.7	25.3
	12	358 31.7	+21 24.9
	13	13 31.6	24.5
	14	28 31.5	24.1
	15	43 31.5	•• 23.7
	16	58 31.4	23.3
	17	73 31.4	22.9
	18	88 31.3	+21 22.5
	19	103 31.2	22.1
	20	118 31.2	21.7
	21	133 31.1	•• 21.3
	22	148 31.1	20.9
	23	163 31.0	20.4
17	0	178 31.0	+21 20.0
	1	193 30.9	19.6
	2	208 30.8	19.2
	3	223 30.8	•• 18.8
	4	238 30.7	18.4
	5	253 30.7	18.0
	6	268 30.6	+21 17.6
	7	283 30.6	17.1
	8	298 30.5	16.7
	9	313 30.5	•• 16.3
	10	328 30.4	15.9
	11	343 30.3	15.5
	12	358 30.3	+21 15.0
	13	13 30.2	14.6
	14	28 30.2	14.2
	15	43 30.1	•• 13.8
	16	58 30.1	13.4
	17	73 30.0	12.9
	18	88 30.0	+21 12.5
	19	103 29.9	12.1
	20	118 29.9	11.7
	21	133 29.8	•• 11.2
	22	148 29.8	10.8
	23	163 29.7	10.4
	24	178 29.7	+21 10.0
code		—	— 4

STARS No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.9	−40 28.8
5	Achernar	335 59.4	−57 27.6
30	Acrux	173 59.1	−62 51.2
19	Adhara	255 47.6	−28 54.5
10	Aldebaran	291 40.3	+16 25.2
32	Alioth	166 59.3	+56 12.6
34	Alkaid	153 33.5	+49 32.6
55	Al Na'ir	28 38.6	−47 10.6
15	Alnilam	276 31.5	− 1 13.7
25	Alphard	218 39.8	− 8 27.7
41	Alphecca	126 48.2	+26 52.1
1	Alpheratz	358 29.1	+28 50.4
51	Altair	62 50.9	+ 8 44.9
2	Ankaa	353 59.0	−42 32.8
42	Antares	113 20.2	−26 20.1
37	Arcturus	146 35.9	+19 25.1
43	Atria	109 01.3	−68 57.1
22	Avior	234 36.8	−59 21.8
13	Bellatrix	279 19.7	+ 6 18.7
16	Betelg'se	271 49.4	+ 7 24.1
17	Canopus	264 16.3	−52 40.1
12	Capella	281 40.1	+45 57.2
53	Deneb	50 01.2	+45 07.0
28	Denebola	183 18.7	+14 49.6
4	Diphda	349 40.0	−18 13.9
27	Dubhe	194 46.0	+62 00.0
14	Elnath	279 08.8	+28 34.3
47	Eltanin	91 06.2	+51 29.7
54	Enif	34 30.2	+ 9 40.0
56	Fomalhaut	16 12.3	−29 51.5
31	Gacrux	172 50.5	−56 51.9
29	Gienah	176 37.9	−17 17.5
35	Hadar	149 50.7	−60 09.7
6	Hamal	328 50.7	+23 14.9
48	Kaus Aust.	84 41.9	−34 24.5
40	Kochab	137 17.3	+74 20.7
57	Markab	14 22.1	+14 57.7
8	Menkar	315 01.4	+ 3 54.9
36	Menkent	148 59.7	−36 09.1
24	Miapl'dus	221 50.2	−69 32.0
9	Mirfak	309 43.9	+49 42.0
50	Nunki	76 52.6	−26 21.3
52	Peacock	54 28.0	−56 52.8
21	Pollux	244 22.0	+28 08.3
20	Procyon	245 46.2	+ 5 20.6
46	R'alhague	96 47.1	+12 35.5
26	Regulus	208 30.7	+12 11.4
11	Rigel	281 54.8	− 8 15.0
38	Rigil Kent.	140 52.1	−60 39.4
44	Sabik	103 02.9	−15 40.3
3	Schedar	350 30.9	+56 17.2
45	Shaula	97 21.5	−37 04.5
18	Sirius	259 13.0	−16 39.0
33	Spica	159 17.8	−10 55.6
23	Suhail	223 25.4	−43 15.0
49	Vega	81 08.4	+38 44.5
39	Zub'g'bi	137 54.2	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 15	Moonrise 16	Moonrise 17	Moonrise 18
N °	h m	h m	h m	h m	h m	h m
72	□	□	■	23 40	22 33	21 59
70	□	□	■	22 47	22 11	21 48
68	□	□	22 52	22 14	21 54	21 40
66	1 37	////	22 03	21 50	21 40	21 33
64	2 16	////	21 31	21 31	21 29	21 27
62	2 44	////	21 07	21 15	21 19	21 22
60	3 04	////	20 48	21 02	21 10	21 17
58	3 21	////	20 33	20 50	21 03	21 13
56	3 35	////	20 19	20 40	20 56	21 09
54	3 48	////	20 07	20 31	20 50	21 06
52	3 58	////	19 57	20 24	20 45	21 03
50	4 08	0 44	19 48	20 16	20 40	21 00
45	4 28	2 07	19 28	20 01	20 29	20 54
40	4 44	2 46	19 12	19 48	20 20	20 49
35	4 57	3 14	18 58	19 38	20 13	20 45
30	5 09	3 35	18 47	19 28	20 06	20 41
20	5 29	4 07	18 26	19 12	19 54	20 34
10	5 46	4 30	18 08	18 57	19 44	20 29
0	6 02	4 48	17 52	18 44	19 34	20 23
10	6 18	5 04	17 35	18 30	19 24	20 18
20	6 35	5 17	17 17	18 16	19 14	20 12
30	6 54	5 30	16 57	17 59	19 02	20 05
35	7 05	5 37	16 45	17 49	18 55	20 01
40	7 18	5 42	16 31	17 38	18 47	19 57
45	7 33	5 49	16 14	17 25	18 38	19 51
50	7 51	5 55	15 54	17 09	18 27	19 45
52	8 00	5 58	15 44	17 01	18 21	19 42
54	8 10	6 01	15 33	16 53	18 16	19 39
56	8 21	6 04	15 20	16 43	18 09	19 36
58	8 33	6 07	15 06	16 32	18 02	19 32
60	8 48	6 10	14 49	16 20	17 54	19 27
S						

Lat.	Sunset	Twlt. ends	Moonset 15	Moonset 16	Moonset 17	Moonset 18
N °	h m	h m	h m	h m	h m	h m
72	□	□	■	■	2 33	5 24
70	□	□	■	■	3 24	5 44
68	□	□	■	1 30	3 56	5 59
66	22 31	////	26 18	2 18	4 19	6 12
64	21 53	////	1 02	2 49	4 37	6 22
62	21 27	////	1 37	3 12	4 52	6 31
60	21 06	////	2 02	3 31	5 04	6 38
58	20 50	////	2 22	3 46	5 15	6 44
56	20 36	////	2 39	3 59	5 24	6 50
54	20 23	////	2 53	4 10	5 32	6 55
52	20 13	////	3 05	4 20	5 39	7 00
50	20 03	23 21	3 16	4 29	5 46	7 04
45	19 44	22 04	3 39	4 47	6 00	7 13
40	19 28	21 25	3 57	5 03	6 11	7 20
35	19 14	20 57	4 12	5 15	6 21	7 27
30	19 02	20 36	4 25	5 26	6 29	7 32
20	18 43	20 05	4 47	5 45	6 44	7 42
10	18 25	19 41	5 06	6 02	6 56	7 50
0	18 10	19 24	5 24	6 17	7 08	7 58
10	17 54	19 08	5 42	6 32	7 20	8 05
20	17 37	18 55	6 01	6 48	7 32	8 13
30	17 18	18 42	6 23	7 06	7 46	8 22
35	17 07	18 36	6 36	7 17	7 54	8 28
40	16 55	18 31	6 50	7 29	8 03	8 34
45	16 40	18 25	7 08	7 43	8 14	8 40
50	16 22	18 18	7 29	8 01	8 27	8 48
52	16 13	18 15	7 39	8 09	8 33	8 52
54	16 03	18 12	7 50	8 18	8 39	8 56
56	15 52	18 09	8 03	8 28	8 46	9 01
58	15 40	18 07	8 18	8 40	8 55	9 06
60	15 25	18 03	8 36	8 53	9 04	9 11
S						

GMT	Equation of Time (App.—Mean) 15	16	17
h	m s	m s	m s
0	− 5 44.1	− 5 50.3	− 5 56.0
6	− 5 45.7	− 5 51.8	− 5 57.4
12	− 5 47.3	− 5 53.2	− 5 58.7
18	− 5 48.8	− 5 54.7	− 6 00.0
24	− 5 50.3	− 5 56.0	− 6 01.3

GMT of Transit
Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
15	24 04	14 49	22 13	11 20	18 33
16	0 04	14 49	22 08	11 17	18 29
17	0 56	14 49	22 04	11 14	18 25
18	1 46	14 50	21 59	11 11	18 22

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.1	0.1	0.3
30			
	0.1	0.1	0.3
45			
	0.1	0.1	0.2
60			
	0.1	0.1	0.1
75			
	0.1	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	15	16	17
°	′	′	′
0			
	15.0	15.8	16.4
4			
	15.0	15.8	16.4
8			
	15.0	15.8	16.4
12			
	15.1	15.8	16.4
16			
	15.1	15.8	16.4
20			
	15.1	15.8	16.4
24			
	15.1	15.8	16.4
28			
	15.1	15.8	16.3
32			
	15.1	15.8	16.3
36			
	15.1	15.8	16.3
40			
	15.1	15.8	16.3
44			
	15.2	15.7	16.2
48			
	15.2	15.7	16.2
52			
	15.2	15.7	16.2
56			
	15.2	15.7	16.1
60			
	15.3	15.7	16.1
64			
	15.3	15.7	16.0
68			
	15.3	15.7	16.0
72			
	15.3	15.7	15.9
76			
	15.4	15.6	15.9
80			
	15.4	15.6	15.8
84			
	15.4	15.6	15.8
88			
	15.4	15.6	15.8
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	15	16	17
°	′	′	′
0			
	15.8	15.4	15.0
4			
	15.8	15.4	15.0
8			
	15.8	15.4	15.1
12			
	15.8	15.4	15.1
16			
	15.8	15.4	15.1
20			
	15.8	15.4	15.1
24			
	15.8	15.4	15.1
28			
	15.8	15.4	15.1
32			
	15.8	15.4	15.2
36			
	15.8	15.4	15.2
40			
	15.7	15.5	15.2
44			
	15.7	15.5	15.3
48			
	15.7	15.5	15.3
52			
	15.7	15.5	15.3
56			
	15.7	15.5	15.4
60			
	15.6	15.5	15.4
64			
	15.6	15.5	15.5
68			
	15.6	15.5	15.5
72			
	15.6	15.6	15.5
76			
	15.5	15.6	15.6
80			
	15.5	15.6	15.6
84			
	15.5	15.6	15.7
88			
	15.4	15.6	15.7
90			

Subtract from table, back cover

Full Moon 16

GMT	♈ GHA	VENUS −3.5 GHA	VENUS Dec.	MARS −2.0 GHA	MARS Dec.	JUPITER −1.4 GHA	JUPITER Dec.	SATURN 0.8 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
18 0	295 16.1	137 38.1	+10 47.5	29 12.0	−28 22.2	191 55.5	+22 52.5	83 52.3	−10 07.7	334 23.5	112	−12 08.9	+130
1	310 18.6	152 37.9	46.4	44 14.9	22.2	206 57.4	52.5	98 54.8	07.8	348 53.7	113	11 55.9	+130
2	325 21.1	167 37.7	45.2	59 17.8	22.2	221 59.3	52.4	113 57.2	07.8	3 24.0	113	11 42.9	+131
3	340 23.5	182 37.5	·· 44.0	74 20.7	·· 22.2	237 01.1	·· 52.4	128 59.6	·· 07.8	17 54.3	113	·11 29.8	+132
4	355 26.0	197 37.3	42.9	89 23.6	22.2	252 03.0	52.3	144 02.0	07.8	32 24.6	114	11 16.6	+133
5	10 28.5	212 37.1	41.7	104 26.5	22.2	267 04.8	52.3	159 04.5	07.9	46 55.0	114	11 03.3	+133
6	25 30.9	227 36.9	+10 40.6	119 29.4	−28 22.2	282 06.7	+22 52.2	174 06.9	−10 07.9	61 25.4	114	−10 50.0	+134
7	40 33.4	242 36.7	39.4	134 32.3	22.2	297 08.5	52.2	189 09.3	07.9	75 55.8	114	10 36.6	+134
8	55 35.9	257 36.5	38.3	149 35.2	22.2	312 10.4	52.1	204 11.7	07.9	90 26.2	115	10 23.2	+135
9	70 38.3	272 36.3	·· 37.1	164 38.1	·· 22.2	327 12.3	·· 52.1	219 14.2	·· 08.0	104 56.7	115	·10 09.7	+136
10	85 40.8	287 36.1	36.0	179 41.0	22.2	342 14.1	52.0	234 16.6	08.0	119 27.2	115	9 56.1	+136
11	100 43.2	302 35.9	34.8	194 43.9	22.2	357 16.0	52.0	249 19.0	08.0	133 57.7	116	9 42.5	+137
12	115 45.7	317 35.7	+10 33.7	209 46.8	−28 22.2	12 17.8	+22 52.0	264 21.4	−10 08.1	148 28.3	115	− 9 28.8	+137
13	130 48.2	332 35.5	32.5	224 49.7	22.2	27 19.7	51.9	279 23.8	08.1	162 58.8	116	9 15.1	+138
14	145 50.6	347 35.3	31.3	239 52.6	22.2	42 21.6	51.9	294 26.3	08.1	177 29.4	117	9 01.3	+139
15	160 53.1	2 35.1	·· 30.2	254 55.5	·· 22.2	57 23.4	·· 51.8	309 28.7	·· 08.1	192 00.1	116	· 8 47.4	+139
16	175 55.6	17 34.9	29.0	269 58.4	22.2	72 25.3	51.8	324 31.1	08.2	206 30.7	117	8 33.5	+139
17	190 58.0	32 34.8	27.9	285 01.3	22.2	87 27.1	51.7	339 33.5	08.2	221 01.4	117	8 19.6	+140
18	206 00.5	47 34.6	+10 26.7	300 04.1	−28 22.3	102 29.0	+22 51.7	354 35.9	−10 08.2	235 32.1	117	− 8 05.6	+140
19	221 03.0	62 34.4	25.5	315 07.0	22.3	117 30.9	51.6	9 38.4	08.2	250 02.8	117	7 51.6	+141
20	236 05.4	77 34.2	24.4	330 09.9	22.3	132 32.7	51.6	24 40.8	08.3	264 33.5	117	7 37.5	+142
21	251 07.9	92 34.0	·· 23.2	345 12.8	·· 22.3	147 34.6	·· 51.5	39 43.2	·· 08.3	279 04.2	118	· 7 23.3	+142
22	266 10.3	107 33.8	22.1	0 15.7	22.3	162 36.4	51.5	54 45.6	08.3	293 35.0	118	7 09.1	+142
23	281 12.8	122 33.6	20.9	15 18.5	22.3	177 38.3	51.4	69 48.0	08.3	308 05.8	118	6 54.9	+142
19 0	296 15.3	137 33.4	+10 19.7	30 21.4	−28 22.3	192 40.2	+22 51.4	84 50.5	−10 08.4	322 36.6	118	− 6 40.7	+144
1	311 17.7	152 33.2	18.6	45 24.3	22.3	207 42.0	51.3	99 52.9	08.4	337 07.4	118	6 26.3	+143
2	326 20.2	167 33.1	17.4	60 27.2	22.3	222 43.9	51.3	114 55.3	08.4	351 38.2	119	6 12.0	+144
3	341 22.7	182 32.9	·· 16.3	75 30.0	·· 22.3	237 45.7	·· 51.2	129 57.7	·· 08.5	6 09.1	118	· 5 57.6	+144
4	356 25.1	197 32.7	15.1	90 32.9	22.3	252 47.6	51.2	145 00.1	08.5	20 39.9	119	5 43.2	+145
5	11 27.6	212 32.5	13.9	105 35.8	22.3	267 49.5	51.1	160 02.6	08.5	35 10.8	118	5 28.7	+144
6	26 30.1	227 32.3	+10 12.8	120 38.7	−28 22.3	282 51.3	+22 51.1	175 05.0	−10 08.5	49 41.6	119	− 5 14.3	+146
7	41 32.5	242 32.1	11.6	135 41.5	22.3	297 53.2	51.0	190 07.4	08.6	64 12.5	119	4 59.7	+145
8	56 35.0	257 31.9	10.4	150 44.4	22.3	312 55.0	51.0	205 09.8	08.6	78 43.4	119	4 45.2	+146
9	71 37.5	272 31.8	·· 09.3	165 47.2	·· 22.3	327 56.9	·· 50.9	220 12.2	·· 08.6	93 14.3	119	· 4 30.6	+146
10	86 39.9	287 31.6	08.1	180 50.1	22.3	342 58.8	50.9	235 14.7	08.7	107 45.2	119	4 16.0	+147
11	101 42.4	302 31.4	06.9	195 53.0	22.3	358 00.6	50.8	250 17.1	08.7	122 16.1	120	4 01.3	+146
12	116 44.8	317 31.2	+10 05.8	210 55.8	−28 22.3	13 02.5	+22 50.8	265 19.5	−10 08.7	136 47.1	119	− 3 46.7	+147
13	131 47.3	332 31.0	04.6	225 58.7	22.3	28 04.4	50.7	280 21.9	08.7	151 18.0	119	3 32.0	+147
14	146 49.8	347 30.9	03.4	241 01.5	22.3	43 06.2	50.7	295 24.3	08.8	165 48.9	120	3 17.3	+148
15	161 52.2	2 30.7	·· 02.3	256 04.4	·· 22.3	58 08.1	·· 50.6	310 26.7	·· 08.8	180 19.9	119	· 3 02.5	+147
16	176 54.7	17 30.5	10 01.1	271 07.2	22.3	73 09.9	50.6	325 29.2	08.8	194 50.8	119	2 47.8	+148
17	191 57.2	32 30.3	9 59.9	286 10.1	22.2	88 11.8	50.6	340 31.6	08.9	209 21.7	119	2 33.0	+148
18	206 59.6	47 30.1	+ 9 58.8	301 12.9	−28 22.2	103 13.7	+22 50.5	355 34.0	−10 08.9	223 52.6	120	− 2 18.2	+148
19	222 02.1	62 30.0	57.6	316 15.8	22.2	118 15.5	50.5	10 36.4	08.9	238 23.6	119	2 03.4	+149
20	237 04.6	77 29.8	56.4	331 18.6	22.2	133 17.4	50.4	25 38.8	08.9	252 54.5	119	1 48.5	+148
21	252 07.0	92 29.6	·· 55.3	346 21.5	·· 22.2	148 19.2	·· 50.4	40 41.3	·· 09.0	267 25.4	119	· 1 33.7	+149
22	267 09.5	107 29.4	54.1	1 24.3	22.2	163 21.1	50.3	55 43.7	09.0	281 56.3	120	1 18.8	+149
23	282 12.0	122 29.3	52.9	16 27.2	22.2	178 23.0	50.3	70 46.1	09.0	296 27.3	119	1 03.9	+149
20 0	297 14.4	137 29.1	+ 9 51.7	31 30.0	−28 22.2	193 24.8	+22 50.2	85 48.5	−10 09.1	310 58.2	119	− 0 49.0	+149
1	312 16.9	152 28.9	50.6	46 32.9	22.2	208 26.7	50.2	100 50.9	09.1	325 29.1	119	0 34.1	+149
2	327 19.3	167 28.7	49.4	61 35.7	22.2	223 28.5	50.1	115 53.3	09.1	340 00.0	118	0 19.2	+149
3	342 21.8	182 28.6	·· 48.2	76 38.5	·· 22.2	238 30.4	·· 50.1	130 55.7	·· 09.1	354 30.8	119	− 0 04.3	+149
4	357 24.3	197 28.4	47.1	91 41.4	22.2	253 32.3	50.0	145 58.2	09.2	9 01.7	119	+ 0 10.6	+149
5	12 26.7	212 28.2	45.9	106 44.2	22.2	268 34.1	50.0	161 00.6	09.2	23 32.6	118	0 25.5	+149
6	27 29.2	227 28.0	+ 9 44.7	121 47.0	−28 22.2	283 36.0	+22 49.9	176 03.0	−10 09.2	38 03.4	118	+ 0 40.4	+15[illegible]
7	42 31.7	242 27.9	43.5	136 49.9	22.2	298 37.9	49.9	191 05.4	09.3	52 34.2	118	0 55.4	+149
8	57 34.1	257 27.7	42.4	151 52.7	22.2	313 39.7	49.8	206 07.8	09.3	67 05.0	118	1 10.3	+149
9	72 36.6	272 27.5	·· 41.2	166 55.5	·· 22.2	328 41.6	·· 49.8	221 10.2	·· 09.3	81 35.8	118	· 1 25.2	+149
10	87 39.1	287 27.4	40.0	181 58.3	22.2	343 43.4	49.7	236 12.7	09.4	96 06.6	118	1 40.1	+149
11	102 41.5	302 27.2	38.8	197 01.2	22.2	358 45.3	49.7	251 15.1	09.4	110 37.4	117	1 55.0	+150
12	117 44.0	317 27.0	+ 9 37.7	212 04.0	−28 22.2	13 47.2	+22 49.6	266 17.5	−10 09.4	125 08.1	118	+ 2 10.0	+149
13	132 46.4	332 26.9	36.5	227 06.8	22.2	28 49.0	49.6	281 19.9	09.4	139 38.9	117	2 24.9	+149
14	147 48.9	347 26.7	35.3	242 09.6	22.2	43 50.9	49.5	296 22.3	09.5	154 09.6	116	2 39.8	+148
15	162 51.4	2 26.5	·· 34.1	257 12.4	·· 22.2	58 52.8	·· 49.5	311 24.7	·· 09.5	168 40.2	117	· 2 54.6	+149
16	177 53.8	17 26.4	33.0	272 15.3	22.2	73 54.6	49.4	326 27.1	09.5	183 10.9	116	3 09.5	+149
17	192 56.3	32 26.2	31.8	287 18.1	22.2	88 56.5	49.4	341 29.6	09.6	197 41.5	116	3 24.4	+148
18	207 58.8	47 26.0	+ 9 30.6	302 20.9	−28 22.2	103 58.3	+22 49.3	356 32.0	−10 09.6	212 12.1	116	+ 3 39.2	+149
19	223 01.2	62 25.9	29.4	317 23.7	22.1	119 00.2	49.3	11 34.4	09.6	226 42.7	116	3 54.1	+148
20	238 03.7	77 25.7	28.3	332 26.5	22.1	134 02.1	49.2	26 36.8	09.6	241 13.3	115	4 08.9	+148
21	253 06.2	92 25.5	·· 27.1	347 29.3	·· 22.1	149 03.9	·· 49.2	41 39.2	·· 09.7	255 43.8	115	· 4 23.7	+148
22	268 08.6	107 25.4	25.9	2 32.1	22.1	164 05.8	49.1	56 41.6	09.7	270 14.3	114	4 38.5	+148
23	283 11.1	122 25.2	24.7	17 34.9	22.1	179 07.6	49.1	71 44.0	09.7	284 44.7	115	4 53.3	+147
24	298 13.6	137 25.1	+ 9 23.5	32 37.7	−28 22.1	194 09.5	+22 49.0	86 46.4	−10 09.8	299 15.2	114	+ 5 08.0	+147
code	—	− 2	− 12	+ 29	0	+ 19	− 1	+ 24	0				

GMT (h)	SUN GHA (° ′)	SUN Dec. (° ′)
18 0	178 29.7	+21 10.0
1	193 29.6	09.5
2	208 29.6	09.1
3	223 29.5 ••	08.7
4	238 29.5	08.2
5	253 29.4	07.8
6	268 29.4	+21 07.4
7	283 29.3	07.0
8	298 29.3	06.5
9	313 29.2 ••	06.1
10	328 29.2	05.7
11	343 29.1	05.2
12	358 29.1	+21 04.8
13	13 29.0	04.4
14	28 29.0	03.9
15	43 28.9 ••	03.5
16	58 28.9	03.0
17	73 28.8	02.6
18	88 28.8	+21 02.2
19	103 28.7	01.7
20	118 28.7	01.3
21	133 28.6 ••	00.8
22	148 28.6	00.4
23	163 28.5	21 00.0
19 0	178 28.5	+20 59.5
1	193 28.4	59.1
2	208 28.4	58.6
3	223 28.3 ••	58.2
4	238 28.3	57.7
5	253 28.3	57.3
6	268 28.2	+20 56.9
7	283 28.2	56.4
8	298 28.1	56.0
9	313 28.1 ••	55.5
10	328 28.0	55.1
11	343 28.0	54.6
12	358 27.9	+20 54.2
13	13 27.9	53.7
14	28 27.9	53.3
15	43 27.8 ••	52.8
16	58 27.8	52.4
17	73 27.7	51.9
18	88 27.7	+20 51.5
19	103 27.6	51.0
20	118 27.6	50.6
21	133 27.6 ••	50.1
22	148 27.5	49.6
23	163 27.5	49.2
20 0	178 27.4	+20 48.7
1	193 27.4	48.3
2	208 27.4	47.8
3	223 27.3 ••	47.4
4	238 27.3	46.9
5	253 27.2	46.4
6	268 27.2	+20 46.0
7	283 27.2	45.5
8	298 27.1	45.1
9	313 27.1 ••	44.6
10	328 27.0	44.1
11	343 27.0	43.7
12	358 27.0	+20 43.2
13	13 26.9	42.7
14	28 26.9	42.3
15	43 26.9 ••	41.8
16	58 26.8	41.3
17	73 26.8	40.9
18	88 26.8	+20 40.4
19	103 26.7	39.9
20	118 26.7	39.5
21	133 26.6 ••	39.0
22	148 26.6	38.5
23	163 26.6	38.1
24	178 26.5	+20 37.6
code	—	− 5

STARS

No.	Name	SHA (° ′)	Dec. (° ′)
7	Acamar	315 51.9	−40 28.8
5	Achernar	335 59.4	−57 27.6
30	Acrux	173 59.1	−62 51.2
19	Adhara	255 47.6	−28 54.5
10	Aldebaran	291 40.3	+16 25.2
32	Alioth	166 59.3	+56 12.6
34	Alkaid	153 33.5	+49 32.6
55	Al Na'ir	28 38.6	−47 10.6
15	Alnilam	276 31.4	− 1 13.7
25	Alphard	218 39.8	− 8 27.7
41	Alphecca	126 48.2	+26 52.1
1	Alpheratz	358 29.1	+28 50.4
51	Altair	62 50.9	+ 8 44.9
2	Ankaa	353 58.9	−42 32.8
42	Antares	113 20.2	−26 20.1
37	Arcturus	146 35.9	+19 25.2
43	Atria	109 01.3	−68 57.1
22	Avior	234 36.8	−59 21.8
13	Bellatrix	279 19.6	+ 6 18.7
16	Betelg'se	271 49.4	+ 7 24.1
17	Canopus	264 16.3	−52 40.1
12	Capella	281 40.1	+45 57.2
53	Deneb	50 01.2	+45 07.1
28	Denebola	183 18.8	+14 49.6
4	Diphda	349 40.0	−18 13.9
27	Dubhe	194 46.0	+62 00.0
14	Elnath	279 08.8	+28 34.3
47	Eltanin	91 06.2	+51 29.7
54	Enif	34 30.2	+ 9 40.1
56	Fomalhaut	16 12.3	−29 51.5
31	Gacrux	172 50.5	−56 51.9
29	Gienah	176 37.9	−17 17.5
35	Hadar	149 50.7	−60 09.7
6	Hamal	328 50.7	+23 14.9
48	Kaus Aust.	84 41.9	−34 24.5
40	Kochab	137 17.3	+74 20.7
57	Markab	14 22.1	+14 57.7
8	Menkar	315 01.3	+ 3 54.9
36	Menkent	148 59.7	−36 09.1
24	Miapl'dus	221 50.2	−69 31.9
9	Mirfak	309 43.9	+49 42.0
50	Nunki	76 52.6	−26 21.3
52	Peacock	54 28.0	−56 52.8
21	Pollux	244 22.0	+28 08.3
20	Procyon	245 46.2	+ 5 20.6
46	R'alhague	96 47.1	+12 35.6
26	Regulus	208 30.7	+12 11.4
11	Rigel	281 54.7	− 8 15.0
38	Rigil Kent.	140 52.1	−60 39.4
44	Sabik	103 02.9	−15 40.3
3	Schedar	350 30.9	+56 17.2
45	Shaula	97 21.5	−37 04.5
18	Sirius	259 13.0	−16 39.0
33	Spica	159 17.8	−10 55.6
23	Suhail	223 25.4	−43 15.0
49	Vega	81 08.4	+38 44.5
39	Zub'g'bi	137 54.2	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 18	Moonrise 19	Moonrise 20	Moonrise 21
N °	h m	h m	h m	h m	h m	h m
72	▭	▭	21 59	21 31	21 04	20 34
70	▭	▭	21 48	21 29	21 10	20 49
68	0 39	////	21 40	21 27	21 15	21 01
66	1 50	////	21 33	21 26	21 19	21 12
64	2 25	////	21 27	21 24	21 22	21 20
62	2 51	////	21 22	21 23	21 25	21 28
60	3 10	////	21 17	21 22	21 28	21 34
58	3 26	////	21 13	21 22	21 30	21 40
56	3 40	////	21 09	21 21	21 32	21 45
54	3 52	////	21 06	21 20	21 34	21 50
52	4 02	////	21 03	21 19	21 36	21 54
50	4 11	1 00	21 00	21 19	21 38	21 57
45	4 31	2 12	20 54	21 18	21 41	22 06
40	4 46	2 50	20 49	21 17	21 44	22 13
35	4 59	3 17	20 45	21 16	21 46	22 19
30	5 11	3 37	20 41	21 15	21 49	22 24
20	5 30	4 08	20 34	21 14	21 53	22 33
10	5 47	4 31	20 29	21 12	21 56	22 42
0	6 03	4 48	20 23	21 11	22 00	22 49
10	6 18	5 04	20 18	21 10	22 03	22 57
20	6 34	5 18	20 12	21 09	22 07	23 06
30	6 53	5 29	20 05	21 08	22 11	23 16
35	7 04	5 35	20 01	21 07	22 13	23 21
40	7 16	5 41	19 57	21 06	22 16	23 28
45	7 31	5 47	19 51	21 05	22 20	23 35
50	7 48	5 53	19 45	21 04	22 23	23 44
52	7 57	5 56	19 42	21 03	22 25	23 49
54	8 06	5 58	19 39	21 03	22 27	23 53
56	8 17	6 01	19 36	21 02	22 30	23 58
58	8 29	6 04	19 32	21 02	22 32	24 04
60	8 43	6 07	19 27	21 01	22 35	24 11
S						

Lat.	Sunset	Twlt. ends	Moonset 18	Moonset 19	Moonset 20	Moonset 21
N °	h m	h m	h m	h m	h m	h m
72	▭	▭	5 24	7 42	9 54	12 08
70	▭	▭	5 44	7 50	9 52	11 56
68	23 22	////	5 59	7 56	9 50	11 46
66	22 19	////	6 12	8 01	9 48	11 38
64	21 44	////	6 22	8 05	9 47	11 31
62	21 20	////	6 31	8 08	9 46	11 25
60	21 01	////	6 38	8 12	9 45	11 20
58	20 45	////	6 44	8 14	9 44	11 15
56	20 31	////	6 50	8 17	9 44	11 11
54	20 20	////	6 55	8 19	9 43	11 08
52	20 09	////	7 00	8 21	9 42	11 05
50	20 00	23 07	7 04	8 23	9 42	11 02
45	19 41	21 58	7 13	8 27	9 41	10 55
40	19 26	21 21	7 20	8 30	9 40	10 50
35	19 13	20 55	7 27	8 32	9 39	10 45
30	19 01	20 34	7 32	8 35	9 38	10 41
20	18 42	20 04	7 42	8 39	9 37	10 35
10	18 25	19 41	7 50	8 43	9 35	10 29
0	18 10	19 24	7 58	8 46	9 34	10 23
10	17 55	19 09	8 05	8 49	9 33	10 17
20	17 38	18 55	8 13	8 53	9 32	10 11
30	17 20	18 44	8 22	8 57	9 30	10 05
35	17 09	18 38	8 28	8 59	9 30	10 01
40	16 57	18 32	8 34	9 02	9 29	9 56
45	16 42	18 26	8 40	9 04	9 28	9 51
50	16 25	18 21	8 48	9 08	9 26	9 45
52	16 16	18 18	8 52	9 09	9 26	9 42
54	16 07	18 15	8 56	9 11	9 25	9 39
56	15 57	18 13	9 01	9 13	9 24	9 36
58	15 45	18 10	9 06	9 15	9 24	9 32
60	15 31	18 07	9 11	9 17	9 23	9 28
S						

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0			
	0.1	0.1	0.3
30			
	0.1	0.1	0.3
45			
	0.1	0.1	0.2
60			
	0.1	0.1	0.1
75			
	0.1	0.0	0.0
90			

Moon's Lower Limb Add

Alt. °	18 ′	19 ′	20 ′
0			
	17.1	17.6	18.0
4			
	17.1	17.6	18.0
8			
	17.1	17.6	17.9
12			
	17.0	17.5	17.9
16			
	17.0	17.5	17.9
20			
	17.0	17.5	17.8
24			
	17.0	17.4	17.8
28			
	16.9	17.4	17.7
32			
	16.9	17.3	17.6
36			
	16.8	17.2	17.6
40			
	16.8	17.2	17.5
44			
	16.7	17.1	17.4
48			
	16.6	17.0	17.3
52			
	16.6	16.9	17.2
56			
	16.5	16.8	17.1
60			
	16.4	16.7	17.0
64			
	16.4	16.6	16.8
68			
	16.3	16.5	16.7
72			
	16.2	16.4	16.6
76			
	16.1	16.3	16.5
80			
	16.0	16.2	16.3
84			
	16.0	16.1	16.2
88			
	15.9	16.0	16.1
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt. °	18 ′	19 ′	20 ′
0			
	14.7	14.4	14.2
4			
	14.7	14.4	14.2
8			
	14.7	14.4	14.2
12			
	14.7	14.4	14.2
16			
	14.7	14.5	14.3
20			
	14.8	14.5	14.3
24			
	14.8	14.5	14.4
28			
	14.8	14.6	14.4
32			
	14.9	14.7	14.5
36			
	14.9	14.7	14.6
40			
	15.0	14.8	14.7
44			
	15.0	14.9	14.7
48			
	15.1	15.0	14.8
52			
	15.2	15.0	15.0
56			
	15.2	15.1	15.1
60			
	15.3	15.2	15.2
64			
	15.4	15.3	15.3
68			
	15.5	15.4	15.4
72			
	15.5	15.5	15.5
76			
	15.6	15.7	15.7
80			
	15.7	15.8	15.8
84			
	15.8	15.9	15.9
88			
	15.9	16.0	16.0
90			

Subtract from table, back cover

Equation of Time (App.—Mean)

GMT (h)	18 (m s)	19 (m s)	20 (m s)
0	− 6 01.3	− 6 06.0	− 6 10.1
6	− 6 02.5	− 6 07.1	− 6 11.1
12	− 6 03.7	− 6 08.1	− 6 12.0
18	− 6 04.8	− 6 09.1	− 6 12.9
24	− 6 06.0	− 6 10.1	− 6 13.8

GMT of Transit Meridian of Greenwich

DAY	Moon (h m)	Venus (h m)	Mars (h m)	Jupiter (h m)	Saturn (h m)
18	1 46	14 50	21 59	11 11	18 22
19	2 35	14 50	21 54	11 08	18 18
20	3 23	14 50	21 50	11 05	18 14
21	4 11	14 51	21 46	11 02	18 10

GMT	♈ GHA	VENUS −3.6 GHA	VENUS Dec.	MARS −1.9 GHA	MARS Dec.	JUPITER −1.4 GHA	JUPITER Dec.	SATURN 0.8 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
21 0	298 13.6	137 25.1	+ 9 23.5	32 37.7	−28 22.1	194 09.5	+22 49.0	86 46.4	−10 09.8	299 15.2	114	+ 5 08.0	+147
1	313 16.0	152 24.9	22.4	47 40.5	22.1	209 11.4	49.0	101 48.9	09.8	313 45.6	113	5 22.7	+147
2	328 18.5	167 24.7	21.2	62 43.3	22.1	224 13.2	48.9	116 51.3	09.8	328 15.9	114	5 37.4	+147
3	343 20.9	182 24.6	•• 20.0	77 46.1	•• 22.1	239 15.1	•• 48.9	131 53.7	•• 09.9	342 46.3	113	• 5 52.1	+147
4	358 23.4	197 24.4	18.8	92 48.9	22.1	254 17.0	48.8	146 56.1	09.9	357 16.6	112	6 06.8	+146
5	13 25.9	212 24.3	17.6	107 51.7	22.1	269 18.8	48.8	161 58.5	09.9	11 46.8	112	6 21.4	+146
6	28 28.3	227 24.1	+ 9 16.5	122 54.5	−28 22.1	284 20.7	+22 48.7	177 00.9	−10 10.0	26 17.0	112	+ 6 36.0	+145
7	43 30.8	242 23.9	15.3	137 57.3	22.1	299 22.6	48.7	192 03.3	10.0	40 47.2	111	6 50.5	+145
8	58 33.3	257 23.8	14.1	153 00.1	22.1	314 24.4	48.6	207 05.7	10.0	55 17.3	111	7 05.0	+145
9	73 35.7	272 23.6	•• 12.9	168 02.9	•• 22.0	329 26.3	•• 48.6	222 08.1	•• 10.0	69 47.4	111	• 7 19.5	+145
10	88 38.2	287 23.5	11.7	183 05.7	22.0	344 28.1	48.5	237 10.6	10.1	84 17.5	110	7 34.0	+144
11	103 40.7	302 23.3	10.5	198 08.4	22.0	359 30.0	48.5	252 13.0	10.1	98 47.5	110	7 48.4	+144
12	118 43.1	317 23.1	+ 9 09.4	213 11.2	−28 22.0	14 31.9	+22 48.4	267 15.4	−10 10.1	113 17.5	109	+ 8 02.8	+143
13	133 45.6	332 23.0	08.2	228 14.0	22.0	29 33.7	48.4	282 17.8	10.2	127 47.4	108	8 17.1	+143
14	148 48.1	347 22.8	07.0	243 16.8	22.0	44 35.6	48.3	297 20.2	10.2	142 17.2	109	8 31.4	+143
15	163 50.5	2 22.7	•• 05.8	258 19.6	•• 22.0	59 37.5	•• 48.3	312 22.6	•• 10.2	156 47.1	107	• 8 45.7	+142
16	178 53.0	17 22.5	04.6	273 22.4	22.0	74 39.3	48.2	327 25.0	10.3	171 16.8	108	8 59.9	+142
17	193 55.4	32 22.4	03.4	288 25.1	22.0	89 41.2	48.2	342 27.4	10.3	185 46.6	106	9 14.1	+141
18	208 57.9	47 22.2	+ 9 02.2	303 27.9	−28 22.0	104 43.0	+22 48.1	357 29.8	−10 10.3	200 16.2	107	+ 9 28.2	+141
19	224 00.4	62 22.1	9 01.1	318 30.7	22.0	119 44.9	48.1	12 32.2	10.4	214 45.9	105	9 42.3	+140
20	239 02.8	77 21.9	8 59.9	333 33.5	22.0	134 46.8	48.0	27 34.7	10.4	229 15.4	106	9 56.3	+140
21	254 05.3	92 21.8	•• 58.7	348 36.2	•• 21.9	149 48.6	•• 48.0	42 37.1	•• 10.4	243 45.0	104	•10 10.3	+139
22	269 07.8	107 21.6	57.5	3 39.0	21.9	164 50.5	47.9	57 39.5	10.4	258 14.4	104	10 24.2	+138
23	284 10.2	122 21.5	56.3	18 41.8	21.9	179 52.4	47.9	72 41.9	10.5	272 43.8	104	10 38.0	+139
22 0	299 12.7	137 21.3	+ 8 55.1	33 44.5	−28 21.9	194 54.2	+22 47.8	87 44.3	−10 10.5	287 13.2	103	+10 51.9	+137
1	314 15.2	152 21.2	53.9	48 47.3	21.9	209 56.1	47.8	102 46.7	10.5	301 42.5	102	11 05.6	+137
2	329 17.6	167 21.0	52.7	63 50.1	21.9	224 58.0	47.7	117 49.1	10.6	316 11.7	102	11 19.3	+136
3	344 20.1	182 20.9	•• 51.6	78 52.8	•• 21.9	239 59.8	•• 47.7	132 51.5	•• 10.6	330 40.9	101	•11 32.9	+136
4	359 22.5	197 20.7	50.4	93 55.6	21.9	255 01.7	47.6	147 53.9	10.6	345 10.0	101	11 46.5	+135
5	14 25.0	212 20.6	49.2	108 58.3	21.9	270 03.5	47.6	162 56.3	10.7	359 39.1	100	12 00.0	+135
6	29 27.5	227 20.4	+ 8 48.0	124 01.1	−28 21.8	285 05.4	+22 47.5	177 58.7	−10 10.7	14 08.1	99	+12 13.5	+134
7	44 29.9	242 20.3	46.8	139 03.8	21.8	300 07.3	47.5	193 01.1	10.7	28 37.0	99	12 26.9	+133
8	59 32.4	257 20.1	45.6	154 06.6	21.8	315 09.1	47.4	208 03.5	10.8	43 05.9	98	12 40.2	+132
9	74 34.9	272 20.0	•• 44.4	169 09.3	•• 21.8	330 11.0	•• 47.4	223 06.0	•• 10.8	57 34.7	98	•12 53.4	+132
10	89 37.3	287 19.9	43.2	184 12.1	21.8	345 12.9	47.3	238 08.4	10.8	72 03.5	97	13 06.6	+131
11	104 39.8	302 19.7	42.0	199 14.8	21.8	0 14.7	47.3	253 10.8	10.9	86 32.2	96	13 19.7	+130
12	119 42.3	317 19.6	+ 8 40.8	214 17.6	−28 21.8	15 16.6	+22 47.2	268 13.2	−10 10.9	101 00.8	95	+13 32.7	+130
13	134 44.7	332 19.4	39.6	229 20.3	21.8	30 18.5	47.2	283 15.6	10.9	115 29.3	95	13 45.7	+129
14	149 47.2	347 19.3	38.5	244 23.1	21.8	45 20.3	47.1	298 18.0	11.0	129 57.8	94	13 58.6	+128
15	164 49.7	2 19.1	•• 37.3	259 25.8	•• 21.7	60 22.2	•• 47.1	313 20.4	•• 11.0	144 26.2	94	•14 11.4	+127
16	179 52.1	17 19.0	36.1	274 28.6	21.7	75 24.1	47.0	328 22.8	11.0	158 54.6	93	14 24.1	+127
17	194 54.6	32 18.9	34.9	289 31.3	21.7	90 25.9	47.0	343 25.2	11.1	173 22.9	92	14 36.8	+125
18	209 57.0	47 18.7	+ 8 33.7	304 34.0	−28 21.7	105 27.8	+22 46.9	358 27.6	−10 11.1	187 51.1	91	+14 49.3	+125
19	224 59.5	62 18.6	32.5	319 36.8	21.7	120 29.7	46.8	13 30.0	11.1	202 19.2	91	15 01.8	+124
20	240 02.0	77 18.4	31.3	334 39.5	21.7	135 31.5	46.8	28 32.4	11.2	216 47.3	90	15 14.2	+123
21	255 04.4	92 18.3	•• 30.1	349 42.2	•• 21.7	150 33.4	•• 46.7	43 34.8	•• 11.2	231 15.3	89	•15 26.5	+123
22	270 06.9	107 18.2	28.9	4 45.0	21.7	165 35.2	46.7	58 37.2	11.2	245 43.2	89	15 38.8	+121
23	285 09.4	122 18.0	27.7	19 47.7	21.6	180 37.1	46.6	73 39.6	11.3	260 11.1	88	15 50.9	+120
23 0	300 11.8	137 17.9	+ 8 26.5	34 50.4	−28 21.6	195 39.0	+22 46.6	88 42.0	−10 11.3	274 38.9	87	+16 02.9	+120
1	315 14.3	152 17.7	25.3	49 53.1	21.6	210 40.8	46.5	103 44.4	11.3	289 06.6	86	16 14.9	+118
2	330 16.8	167 17.6	24.1	64 55.9	21.6	225 42.7	46.5	118 46.8	11.4	303 34.2	86	16 26.7	+118
3	345 19.2	182 17.5	•• 22.9	79 58.6	•• 21.6	240 44.6	•• 46.4	133 49.3	•• 11.4	318 01.8	85	•16 38.5	+117
4	0 21.7	197 17.3	21.7	95 01.3	21.6	255 46.4	46.4	148 51.7	11.4	332 29.3	84	16 50.2	+115
5	15 24.2	212 17.2	20.5	110 04.0	21.6	270 48.3	46.3	163 54.1	11.5	346 56.7	83	17 01.7	+115
6	30 26.6	227 17.1	+ 8 19.3	125 06.7	−28 21.5	285 50.2	+22 46.3	178 56.5	−10 11.5	1 24.0	83	+17 13.2	+114
7	45 29.1	242 16.9	18.1	140 09.5	21.5	300 52.0	46.2	193 58.9	11.5	15 51.3	82	17 24.6	+113
8	60 31.5	257 16.8	16.9	155 12.2	21.5	315 53.9	46.2	209 01.3	11.6	30 18.5	81	17 35.9	+111
9	75 34.0	272 16.7	•• 15.7	170 14.9	•• 21.5	330 55.8	•• 46.1	224 03.7	•• 11.6	44 45.6	81	•17 47.0	+111
10	90 36.5	287 16.5	14.5	185 17.6	21.5	345 57.6	46.1	239 06.1	11.6	59 12.7	79	17 58.1	+109
11	105 38.9	302 16.4	13.3	200 20.3	21.5	0 59.5	46.0	254 08.5	11.7	73 39.6	79	18 09.0	+109
12	120 41.4	317 16.3	+ 8 12.1	215 23.0	−28 21.5	16 01.4	+22 46.0	269 10.9	−10 11.7	88 06.5	78	+18 19.9	+107
13	135 43.9	332 16.1	10.9	230 25.7	21.4	31 03.2	45.9	284 13.3	11.7	102 33.3	78	18 30.6	+106
14	150 46.3	347 16.0	09.7	245 28.4	21.4	46 05.1	45.9	299 15.7	11.8	117 00.1	76	18 41.2	+105
15	165 48.8	2 15.9	•• 08.5	260 31.1	•• 21.4	61 07.0	•• 45.8	314 18.1	•• 11.8	131 26.7	76	•18 51.7	+104
16	180 51.3	17 15.8	07.3	275 33.8	21.4	76 08.8	45.8	329 20.5	11.8	145 53.3	75	19 02.1	+103
17	195 53.7	32 15.6	06.1	290 36.5	21.4	91 10.7	45.7	344 22.9	11.9	160 19.8	75	19 12.4	+102
18	210 56.2	47 15.5	+ 8 04.9	305 39.2	−28 21.4	106 12.6	+22 45.7	359 25.3	−10 11.9	174 46.3	73	+19 22.6	+100
19	225 58.6	62 15.4	03.7	320 41.9	21.4	121 14.4	45.6	14 27.7	11.9	189 12.6	73	19 32.6	+ 99
20	241 01.1	77 15.2	02.5	335 44.6	21.3	136 16.3	45.6	29 30.1	12.0	203 38.9	72	19 42.5	+ 99
21	256 03.6	92 15.1	•• 01.3	350 47.3	•• 21.3	151 18.2	•• 45.5	44 32.5	•• 12.0	218 05.1	72	•19 52.4	+ 96
22	271 06.0	107 15.0	8 00.1	5 50.0	21.3	166 20.0	45.5	59 34.9	12.0	232 31.3	70	20 02.0	+ 96
23	286 08.5	122 14.9	7 58.9	20 52.7	21.3	181 21.9	45.4	74 37.3	12.1	246 57.3	70	20 11.6	+ 94
24	301 11.0	137 14.7	+ 7 57.7	35 55.4	−28 21.3	196 23.8	+22 45.3	89 39.7	−10 12.1	261 23.3	69	+20 21.0	+ 93
code	—	− 2	− 12	+ 27	0	+ 19	0	+ 24	0				

GMT		SUN GHA	SUN Dec.
	h	° ′	° ′
21	0	178 26.5	+20 37.6
	1	193 26.5	37.1
	2	208 26.5	36.6
	3	223 26.4	.. 36.2
	4	238 26.4	35.7
	5	253 26.4	35.2
	6	268 26.3	+20 34.8
	7	283 26.3	34.3
	8	298 26.3	33.8
	9	313 26.2	.. 33.3
	10	328 26.2	32.8
	11	343 26.2	32.4
	12	358 26.1	+20 31.9
	13	13 26.1	31.4
	14	28 26.1	30.9
	15	43 26.0	.. 30.4
	16	58 26.0	30.0
	17	73 26.0	29.5
	18	88 25.9	+20 29.0
	19	103 25.9	28.5
	20	118 25.9	28.0
	21	133 25.9	.. 27.6
	22	148 25.8	27.1
	23	163 25.8	26.6
22	0	178 25.8	+20 26.1
	1	193 25.7	25.6
	2	208 25.7	25.1
	3	223 25.7	.. 24.6
	4	238 25.7	24.2
	5	253 25.6	23.7
	6	268 25.6	+20 23.2
	7	283 25.6	22.7
	8	298 25.5	22.2
	9	313 25.5	.. 21.7
	10	328 25.5	21.2
	11	343 25.5	20.7
	12	358 25.4	+20 20.2
	13	13 25.4	19.7
	14	28 25.4	19.2
	15	43 25.3	.. 18.7
	16	58 25.3	18.2
	17	73 25.3	17.8
	18	88 25.3	+20 17.3
	19	103 25.2	16.8
	20	118 25.2	16.3
	21	133 25.2	.. 15.8
	22	148 25.2	15.3
	23	163 25.2	14.8
23	0	178 25.1	+20 14.3
	1	193 25.1	13.8
	2	208 25.1	13.3
	3	223 25.1	.. 12.8
	4	238 25.0	12.3
	5	253 25.0	11.8
	6	268 25.0	+20 11.3
	7	283 25.0	10.7
	8	298 24.9	10.2
	9	313 24.9	.. 09.7
	10	328 24.9	09.2
	11	343 24.9	08.7
	12	358 24.9	+20 08.2
	13	13 24.8	07.7
	14	28 24.8	07.2
	15	43 24.8	.. 06.7
	16	58 24.8	06.2
	17	73 24.8	05.7
	18	88 24.7	+20 05.2
	19	103 24.7	04.7
	20	118 24.7	04.1
	21	133 24.7	.. 03.6
	22	148 24.7	03.1
	23	163 24.6	02.6
	24	178 24.6	+20 02.1
code		–	– 5

No.	STARS Name	SHA ° ′	Dec. ° ′
7	Acamar	315 51.9	−40 28.8
5	Achernar	335 59.4	−57 27.6
30	Acrux	173 59.2	−62 51.2
19	Adhara	255 47.6	−28 54.4
10	Aldebaran	291 40.3	+16 25.2
32	Alioth	166 59.3	+56 12.6
34	Alkaid	153 33.5	+49 32.6
55	Al Na'ir	28 38.6	−47 10.7
15	Alnilam	276 31.4	− 1 13.6
25	Alphard	218 39.8	− 8 27.7
41	Alphecca	126 48.2	+26 52.1
1	Alpheratz	358 29.1	+28 50.4
51	Altair	62 50.9	+ 8 44.9
2	Ankaa	353 58.9	−42 32.8
42	Antares	113 20.2	−26 20.1
37	Arcturus	146 35.9	+19 25.2
43	Atria	109 01.3	−68 57.1
22	Avior	234 36.8	−59 21.8
13	Bellatrix	279 19.6	+ 6 18.7
16	Betelg'se	271 49.4	+ 7 24.1
17	Canopus	264 16.3	−52 40.0
12	Capella	281 40.1	+45 57.2
53	Deneb	50 01.2	+45 07.1
28	Denebola	183 18.8	+14 49.6
4	Diphda	349 40.0	−18 13.9
27	Dubhe	194 46.0	+61 59.9
14	Elnath	279 08.7	+28 34.3
47	Eltanin	91 06.2	+51 29.7
54	Enif	34 30.1	+ 9 40.1
56	Fomalhaut	16 12.3	−29 51.5
31	Gacrux	172 50.5	−56 51.9
29	Gienah	176 37.9	−17 17.5
35	Hadar	149 50.7	−60 09.7
6	Hamal	328 50.7	+23 15.0
48	Kaus Aust.	84 41.9	−34 24.5
40	Kochab	137 17.4	+74 20.7
57	Markab	14 22.1	+14 57.7
8	Menkar	315 01.3	+ 3 54.9
36	Menkent	148 59.7	−36 09.1
24	Miapl'dus	221 50.2	−69 31.9
9	Mirfak	309 43.9	+49 42.0
50	Nunki	76 52.6	−26 21.3
52	Peacock	54 28.0	−56 52.8
21	Pollux	244 22.0	+28 08.3
20	Procyon	245 46.2	+ 5 20.6
46	R'alhague	96 47.1	+12 35.6
26	Regulus	208 30.7	+12 11.4
11	Rigel	281 54.7	− 8 15.0
38	Rigil Kent.	140 52.1	−60 39.4
44	Sabik	103 02.9	−15 40.3
3	Schedar	350 30.9	+56 17.2
45	Shaula	97 21.5	−37 04.5
18	Sirius	259 12.9	−16 39.0
33	Spica	159 17.8	−10 55.6
23	Suhail	223 25.4	−43 15.0
49	Vega	81 08.4	+38 44.5
39	Zub'g'bi	137 54.2	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 21	Moonrise 22	Moonrise 23	Moonrise 24
N °	h m	h m	h m	h m	h m	h m
72	□	□	20 34	19 49	□	□
70	□	□	20 49	20 21	19 20	□
68	1 10	////	21 01	20 45	20 19	□
66	2 03	////	21 12	21 04	20 53	20 35
64	2 35	////	21 20	21 19	21 19	21 22
62	2 58	////	21 28	21 32	21 38	21 52
60	3 17	////	21 34	21 42	21 55	22 16
58	3 32	////	21 40	21 52	22 09	22 34
56	3 45	////	21 45	22 00	22 21	22 50
54	3 56	////	21 50	22 08	22 31	23 04
52	4 06	////	21 54	22 15	22 41	23 16
50	4 15	1 13	21 57	22 21	22 49	23 26
45	4 34	2 18	22 06	22 34	23 07	23 48
40	4 49	2 54	22 13	22 45	23 22	24 06
35	5 02	3 20	22 19	22 54	23 34	24 21
30	5 13	3 40	22 24	23 02	23 45	24 34
20	5 31	4 10	22 33	23 17	24 04	0 04
10	5 48	4 31	22 42	23 29	24 21	0 21
0	6 03	4 50	22 49	23 41	24 37	0 37
10	6 18	5 04	22 57	23 53	24 52	0 52
20	6 34	5 17	23 06	24 06	0 06	1 09
30	6 52	5 28	23 16	24 21	0 21	1 29
35	7 02	5 34	23 21	24 30	0 30	1 40
40	7 14	5 40	23 28	24 40	0 40	1 53
45	7 28	5 45	23 35	24 52	0 52	2 09
50	7 45	5 52	23 44	25 06	1 06	2 29
52	7 53	5 54	23 49	25 13	1 13	2 38
54	8 02	5 56	23 53	25 21	1 21	2 48
56	8 12	5 59	23 58	25 29	1 29	3 00
58	8 24	6 02	24 04	0 04	1 39	3 14
60	8 37	6 04	24 11	0 11	1 50	3 30
S						

Lat.	Sunset	Twlt. ends	Moonset 21	Moonset 22	Moonset 23	Moonset 24
N °	h m	h m	h m	h m	h m	h m
72	□	□	12 08	14 41	□	□
70	□	□	11 56	14 11	17 06	□
68	22 56	////	11 46	13 49	16 09	□
66	22 06	////	11 38	13 32	15 35	17 53
64	21 36	////	11 31	13 18	15 11	17 07
62	21 13	////	11 25	13 07	14 52	16 37
60	20 55	////	11 20	12 57	14 36	16 14
58	20 39	////	11 15	12 48	14 23	15 56
56	20 27	////	11 11	12 41	14 12	15 41
54	20 16	////	11 08	12 34	14 02	15 28
52	20 06	////	11 05	12 28	13 53	15 16
50	19 57	22 55	11 02	12 23	13 45	15 06
45	19 38	21 52	10 55	12 11	13 28	14 45
40	19 23	21 17	10 50	12 02	13 15	14 28
35	19 11	20 52	10 45	11 54	13 03	14 13
30	19 00	20 32	10 41	11 47	12 53	14 01
20	18 41	20 02	10 35	11 34	12 36	13 40
10	18 25	19 41	10 29	11 24	12 21	13 21
0	18 10	19 23	10 23	11 14	12 07	13 04
10	17 55	19 09	10 17	11 04	11 53	12 47
20	17 40	18 57	10 11	10 53	11 39	12 28
30	17 22	18 46	10 05	10 41	11 22	12 07
35	17 11	18 40	10 01	10 34	11 12	11 55
40	16 59	18 34	9 56	10 26	11 01	11 41
45	16 45	18 29	9 51	10 17	10 48	11 24
50	16 28	18 23	9 45	10 06	10 32	11 04
52	16 20	18 21	9 42	10 01	10 24	10 54
54	16 11	18 18	9 39	9 56	10 16	10 43
56	16 01	18 16	9 36	9 50	10 07	10 31
58	15 50	18 14	9 32	9 43	9 57	10 17
60	15 36	18 11	9 28	9 35	9 45	10 00
S						

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0–30	0.1	0.1	0.3
30–45	0.1	0.1	0.3
45–60	0.1	0.1	0.2
60–75	0.1	0.1	0.1
75–90	0.1	0.0	0.0

Moon's Lower Limb
Add

Alt.	21	22	23
°	′	′	′
0–4	18.2	18.5	18.5
4–8	18.2	18.5	18.5
8–12	18.2	18.4	18.4
12–16	18.2	18.4	18.4
16–20	18.1	18.4	18.4
20–24	18.1	18.3	18.3
24–28	18.0	18.2	18.2
28–32	17.9	18.2	18.2
32–36	17.9	18.1	18.1
36–40	17.8	18.0	18.0
40–44	17.7	17.9	17.9
44–48	17.6	17.8	17.8
48–52	17.5	17.7	17.7
52–56	17.4	17.5	17.5
56–60	17.2	17.4	17.4
60–64	17.1	17.3	17.3
64–68	17.0	17.1	17.1
68–72	16.8	17.0	17.0
72–76	16.7	16.8	16.8
76–80	16.6	16.7	16.7
80–84	16.4	16.5	16.5
84–88	16.3	16.3	16.3
88–90	16.2	16.2	16.2

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	21	22	23
°	′	′	′
0–4	14.0	13.9	13.9
4–8	14.0	13.9	13.9
8–12	14.1	13.9	13.9
12–16	14.1	13.9	13.9
16–20	14.1	14.0	14.0
20–24	14.2	14.0	14.0
24–28	14.2	14.1	14.1
28–32	14.3	14.2	14.2
32–36	14.4	14.3	14.3
36–40	14.5	14.4	14.4
40–44	14.6	14.5	14.5
44–48	14.7	14.6	14.6
48–52	14.8	14.7	14.7
52–56	14.9	14.8	14.8
56–60	15.0	15.0	15.0
60–64	15.1	15.1	15.1
64–68	15.3	15.2	15.2
68–72	15.4	15.4	15.4
72–76	15.5	15.5	15.5
76–80	15.7	15.7	15.7
80–84	15.8	15.9	15.9
84–88	16.0	16.0	16.0
88–90	16.1	16.1	16.1

Subtract from table, back cover

Equation of Time (App.—Mean)

GMT	21	22	23
h	m s	m s	m s
0	− 6 13.8	− 6 16.9	− 6 19.4
6	− 6 14.6	− 6 17.6	− 6 20.0
12	− 6 15.4	− 6 18.2	− 6 20.5
18	− 6 16.2	− 6 18.9	− 6 21.0
24	− 6 16.9	− 6 19.4	− 6 21.4

GMT of Transit
Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
21	4 11	14 51	21 46	11 02	18 10
22	5 01	14 51	21 41	10 59	18 06
23	5 54	14 51	21 37	10 56	18 02
24	6 50	14 51	21 33	10 53	17 59

Last Quarter 23

G M T	♈ GHA	VENUS −3.6 GHA	Dec.	MARS −1.8 GHA	Dec.	JUPITER −1.4 GHA	Dec.	SATURN 0.8 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
24 0	301 11.0	137 14.7	+ 7 57.7	35 55.4	−28 21.3	196 23.8	+22 45.3	89 39.7	−10 12.1	261 23.3	69	+20 21.0	+ 93
1	316 13.4	152 14.6	56.5	50 58.1	21.3	211 25.6	45.3	104 42.1	12.1	275 49.2	69	20 30.3	+ 92
2	331 15.9	167 14.5	55.3	66 00.8	21.2	226 27.5	45.2	119 44.5	12.2	290 15.1	67	20 39.5	+ 91
3	346 18.4	182 14.4	•• 54.1	81 03.4	•• 21.2	241 29.4	•• 45.2	134 46.9	•• 12.2	304 40.8	67	·20 48.6	+ 89
4	1 20.8	197 14.2	52.9	96 06.1	21.2	256 31.2	45.1	149 49.3	12.2	319 06.5	66	20 57.5	+ 88
5	16 23.3	212 14.1	51.7	111 08.8	21.2	271 33.1	45.1	164 51.7	12.3	333 32.1	66	21 06.3	+ 86
6	31 25.8	227 14.0	+ 7 50.5	126 11.5	−28 21.2	286 35.0	+22 45.0	179 54.1	−10 12.3	347 57.7	65	+21 14.9	+ 86
7	46 28.2	242 13.9	49.3	141 14.2	21.2	301 36.8	45.0	194 56.5	12.3	2 23.2	64	21 23.5	+ 83
8	61 30.7	257 13.7	48.1	156 16.8	21.1	316 38.7	44.9	209 58.9	12.4	16 48.6	63	21 31.8	+ 83
9	76 33.1	272 13.6	•• 46.9	171 19.5	•• 21.1	331 40.6	•• 44.9	225 01.3	•• 12.4	31 13.9	63	·21 40.1	+ 81
10	91 35.6	287 13.5	45.7	186 22.2	21.1	346 42.4	44.8	240 03.7	12.4	45 39.2	62	21 48.2	+ 80
11	106 38.1	302 13.4	44.5	201 24.8	21.1	1 44.3	44.8	255 06.1	12.5	60 04.4	61	21 56.2	+ 78
12	121 40.5	317 13.3	+ 7 43.2	216 27.5	−28 21.1	16 46.2	+22 44.7	270 08.5	−10 12.5	74 29.5	61	+22 04.0	+ 77
13	136 43.0	332 13.1	42.0	231 30.2	21.0	31 48.0	44.7	285 10.9	12.5	88 54.6	60	22 11.7	+ 75
14	151 45.5	347 13.0	40.8	246 32.9	21.0	46 49.9	44.6	300 13.3	12.6	103 19.6	59	22 19.2	+ 74
15	166 47.9	2 12.9	•• 39.6	261 35.5	•• 21.0	61 51.8	•• 44.6	315 15.7	•• 12.6	117 44.5	59	·22 26.6	+ 73
16	181 50.4	17 12.8	38.4	276 38.2	21.0	76 53.6	44.5	330 18.1	12.7	132 09.4	58	22 33.9	+ 71
17	196 52.9	32 12.7	37.2	291 40.8	21.0	91 55.5	44.5	345 20.5	12.7	146 34.2	58	22 41.0	+ 70
18	211 55.3	47 12.6	+ 7 36.0	306 43.5	−28 21.0	106 57.4	+22 44.4	0 22.9	−10 12.7	160 59.0	56	+22 48.0	+ 68
19	226 57.8	62 12.4	34.8	321 46.2	20.9	121 59.2	44.4	15 25.3	12.8	175 23.6	57	22 54.8	+ 67
20	242 00.3	77 12.3	33.6	336 48.8	20.9	137 01.1	44.3	30 27.7	12.8	189 48.3	55	23 01.5	+ 65
21	257 02.7	92 12.2	•• 32.4	351 51.5	•• 20.9	152 03.0	•• 44.2	45 30.1	•• 12.8	204 12.8	56	·23 08.0	+ 63
22	272 05.2	107 12.1	31.2	6 54.1	20.9	167 04.8	44.2	60 32.5	12.9	218 37.4	54	23 14.3	+ 63
23	287 07.6	122 12.0	29.9	21 56.8	20.9	182 06.7	44.1	75 34.9	12.9	233 01.8	54	23 20.6	+ 60
25 0	302 10.1	137 11.9	+ 7 28.7	36 59.4	−28 20.8	197 08.6	+22 44.1	90 37.3	−10 12.9	247 26.2	54	+23 26.6	+ 59
1	317 12.6	152 11.8	27.5	52 02.1	20.8	212 10.4	44.0	105 39.7	13.0	261 50.6	53	23 32.5	+ 58
2	332 15.0	167 11.6	26.3	67 04.7	20.8	227 12.3	44.0	120 42.1	13.0	276 14.9	52	23 38.3	+ 55
3	347 17.5	182 11.5	•• 25.1	82 07.4	•• 20.8	242 14.2	•• 43.9	135 44.5	•• 13.0	290 39.1	52	·23 43.8	+ 55
4	2 20.0	197 11.4	23.9	97 10.0	20.8	257 16.0	43.9	150 46.9	13.1	305 03.3	51	23 49.3	+ 53
5	17 22.4	212 11.3	22.7	112 12.6	20.7	272 17.9	43.8	165 49.3	13.1	319 27.4	51	23 54.6	+ 51
6	32 24.9	227 11.2	+ 7 21.5	127 15.3	−28 20.7	287 19.8	+22 43.8	180 51.7	−10 13.2	333 51.5	51	+23 59.7	+ 49
7	47 27.4	242 11.1	20.3	142 17.9	20.7	302 21.7	43.7	195 54.0	13.2	348 15.6	50	24 04.6	+ 48
8	62 29.8	257 11.0	19.0	157 20.6	20.7	317 23.5	43.7	210 56.4	13.2	2 39.6	50	24 09.4	+ 47
9	77 32.3	272 10.9	•• 17.8	172 23.2	•• 20.7	332 25.4	•• 43.6	225 58.8	•• 13.3	17 03.6	49	·24 14.1	+ 44
10	92 34.8	287 10.7	16.6	187 25.8	20.6	347 27.3	43.6	241 01.2	13.3	31 27.5	49	24 18.5	+ 43
11	107 37.2	302 10.6	15.4	202 28.5	20.6	2 29.1	43.5	256 03.6	13.3	45 51.4	49	24 22.8	+ 42
12	122 39.7	317 10.5	+ 7 14.2	217 31.1	−28 20.6	17 31.0	+22 43.5	271 06.0	−10 13.4	60 15.3	48	+24 27.0	+ 40
13	137 42.1	332 10.4	13.0	232 33.7	20.6	32 32.9	43.4	286 08.4	13.4	74 39.1	48	24 31.0	+ 38
14	152 44.6	347 10.3	11.8	247 36.3	20.6	47 34.7	43.3	301 10.8	13.4	89 02.9	47	24 34.8	+ 36
15	167 47.1	2 10.2	•• 10.5	262 39.0	•• 20.5	62 36.6	•• 43.3	316 13.2	•• 13.5	103 26.6	48	·24 38.4	+ 35
16	182 49.5	17 10.1	09.3	277 41.6	20.5	77 38.5	43.2	331 15.6	13.5	117 50.4	46	24 41.9	+ 33
17	197 52.0	32 10.0	08.1	292 44.2	20.5	92 40.3	43.2	346 18.0	13.6	132 14.0	47	24 45.2	+ 32
18	212 54.5	47 09.9	+ 7 06.9	307 46.8	−28 20.5	107 42.2	+22 43.1	1 20.4	−10 13.6	146 37.7	47	+24 48.4	+ 30
19	227 56.9	62 09.8	05.7	322 49.4	20.5	122 44.1	43.1	16 22.8	13.6	161 01.4	46	24 51.4	+ 28
20	242 59.4	77 09.7	04.5	337 52.1	20.4	137 46.0	43.0	31 25.2	13.7	175 25.0	46	24 54.2	+ 26
21	258 01.9	92 09.6	•• 03.2	352 54.7	•• 20.4	152 47.8	•• 43.0	46 27.6	•• 13.7	189 48.6	46	·24 56.8	+ 25
22	273 04.3	107 09.5	02.0	7 57.3	20.4	167 49.7	42.9	61 30.0	13.7	204 12.2	46	24 59.3	+ 23
23	288 06.8	122 09.4	7 00.8	22 59.9	20.4	182 51.6	42.9	76 32.4	13.8	218 35.8	45	25 01.6	+ 22
26 0	303 09.3	137 09.3	+ 6 59.6	38 02.5	−28 20.4	197 53.4	+22 42.8	91 34.8	−10 13.8	232 59.3	46	+25 03.8	+ 20
1	318 11.7	152 09.2	58.4	53 05.1	20.3	212 55.3	42.8	106 37.1	13.8	247 22.9	45	25 05.8	+ 18
2	333 14.2	167 09.1	57.2	68 07.7	20.3	227 57.2	42.7	121 39.5	13.9	261 46.4	45	25 07.6	+ 16
3	348 16.6	182 09.0	•• 55.9	83 10.3	•• 20.3	242 59.0	•• 42.6	136 41.9	•• 13.9	276 09.9	45	·25 09.2	+ 15
4	3 19.1	197 08.9	54.7	98 12.9	20.3	258 00.9	42.6	151 44.3	14.0	290 33.4	45	25 10.7	+ 12
5	18 21.6	212 08.8	53.5	113 15.5	20.2	273 02.8	42.5	166 46.7	14.0	304 56.9	45	25 11.9	+ 12
6	33 24.0	227 08.7	+ 6 52.3	128 18.1	−28 20.2	288 04.6	+22 42.5	181 49.1	−10 14.0	319 20.4	46	+25 13.1	+ 9
7	48 26.5	242 08.6	51.1	143 20.7	20.2	303 06.5	42.4	196 51.5	14.1	333 44.0	45	25 14.0	+ 8
8	63 29.0	257 08.5	49.9	158 23.3	20.2	318 08.4	42.4	211 53.9	14.1	348 07.5	45	25 14.8	+ 6
9	78 31.4	272 08.4	•• 48.6	173 25.9	•• 20.2	333 10.3	•• 42.3	226 56.3	•• 14.1	2 31.0	45	·25 15.4	+ 5
10	93 33.9	287 08.3	47.4	188 28.5	20.1	348 12.1	42.3	241 58.7	14.2	16 54.5	45	25 15.9	+ 2
11	108 36.4	302 08.2	46.2	203 31.1	20.1	3 14.0	42.2	257 01.1	14.2	31 18.0	46	25 16.1	+ 1
12	123 38.8	317 08.1	+ 6 45.0	218 33.7	−28 20.1	18 15.9	+22 42.2	272 03.5	−10 14.3	45 41.6	45	+25 16.2	0
13	138 41.3	332 08.0	43.8	233 36.3	20.1	33 17.7	42.1	287 05.9	14.3	60 05.1	46	25 16.2	− 3
14	153 43.7	347 07.9	42.5	248 38.9	20.0	48 19.6	42.1	302 08.2	14.3	74 28.7	46	25 15.9	− 4
15	168 46.2	2 07.8	•• 41.3	263 41.5	•• 20.0	63 21.5	•• 42.0	317 10.6	•• 14.4	88 52.3	46	·25 15.5	− 6
16	183 48.7	17 07.7	40.1	278 44.0	20.0	78 23.4	41.9	332 13.0	14.4	103 15.9	46	25 14.9	− 7
17	198 51.1	32 07.6	38.9	293 46.6	20.0	93 25.2	41.9	347 15.4	14.4	117 39.5	46	25 14.2	− 9
18	213 53.6	47 07.5	+ 6 37.6	308 49.2	−28 19.9	108 27.1	+22 41.8	2 17.8	−10 14.5	132 03.1	47	+25 13.3	− 11
19	228 56.1	62 07.4	36.4	323 51.8	19.9	123 29.0	41.8	17 20.2	14.5	146 26.8	47	25 12.2	− 13
20	243 58.5	77 07.3	35.2	338 54.4	19.9	138 30.8	41.7	32 22.6	14.6	160 50.5	47	25 10.9	− 14
21	259 01.0	92 07.2	•• 34.0	353 56.9	•• 19.9	153 32.7	•• 41.7	47 25.0	•• 14.6	175 14.2	48	·25 09.5	− 16
22	274 03.5	107 07.1	32.8	8 59.5	19.8	168 34.6	41.6	62 27.4	14.6	189 38.0	48	25 07.9	− 17
23	289 05.9	122 07.0	31.5	24 02.1	19.8	183 36.4	41.6	77 29.8	14.7	204 01.8	48	25 06.2	− 19
24	304 08.4	137 06.9	+ 6 30.3	39 04.6	−28 19.8	198 38.3	+22 41.5	92 32.1	−10 14.7	218 25.6	48	+25 04.3	− 21
code	—	− 1	− 12	+ 26	0	+ 19	− 1	+ 24	0				

GMT		SUN GHA	SUN Dec.
	h	° ′	° ′
24	0	178 24.6	+20 02.1
	1	193 24.6	01.6
	2	208 24.6	01.1
	3	223 24.6	·· 00.5
	4	238 24.6	20 00.0
	5	253 24.5	19 59.5
	6	268 24.5	+19 59.0
	7	283 24.5	58.5
	8	298 24.5	58.0
	9	313 24.5	·· 57.4
	10	328 24.5	56.9
	11	343 24.5	56.4
	12	358 24.4	+19 55.9
	13	13 24.4	55.4
	14	28 24.4	54.8
	15	43 24.4	·· 54.3
	16	58 24.4	53.8
	17	73 24.4	53.3
	18	88 24.3	+19 52.7
	19	103 24.3	52.2
	20	118 24.3	51.7
	21	133 24.3	·· 51.2
	22	148 24.3	50.6
	23	163 24.3	50.1
25	0	178 24.3	+19 49.6
	1	193 24.3	49.0
	2	208 24.3	48.5
	3	223 24.2	·· 48.0
	4	238 24.2	47.5
	5	253 24.2	46.9
	6	268 24.2	+19 46.4
	7	283 24.2	45.9
	8	298 24.2	45.3
	9	313 24.2	·· 44.8
	10	328 24.2	44.3
	11	343 24.2	43.7
	12	358 24.1	+19 43.2
	13	13 24.1	42.7
	14	28 24.1	42.1
	15	43 24.1	·· 41.6
	16	58 24.1	41.1
	17	73 24.1	40.5
	18	88 24.1	+19 40.0
	19	103 24.1	39.4
	20	118 24.1	38.9
	21	133 24.1	·· 38.4
	22	148 24.1	37.8
	23	163 24.1	37.3
26	0	178 24.1	+19 36.7
	1	193 24.1	36.2
	2	208 24.0	35.6
	3	223 24.0	·· 35.1
	4	238 24.0	34.6
	5	253 24.0	34.0
	6	268 24.0	+19 33.5
	7	283 24.0	32.9
	8	298 24.0	32.4
	9	313 24.0	·· 31.8
	10	328 24.0	31.3
	11	343 24.0	30.7
	12	358 24.0	+19 30.2
	13	13 24.0	29.6
	14	28 24.0	29.1
	15	43 24.0	·· 28.5
	16	58 24.0	28.0
	17	73 24.0	27.4
	18	88 24.0	+19 26.9
	19	103 24.0	26.3
	20	118 24.0	25.8
	21	133 24.0	·· 25.2
	22	148 24.0	24.7
	23	163 24.0	24.1
	24	178 24.0	+19 23.6
code		—	−5

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.8	−40 28.8
5	Achernar	335 59.3	−57 27.6
30	Acrux	173 59.2	−62 51.2
19	Adhara	255 47.6	−28 54.4
10	Aldebaran	291 40.3	+16 25.2
32	Alioth	166 59.4	+56 12.6
34	Alkaid	153 33.5	+49 32.6
55	Al Na'ir	28 38.5	−47 10.7
15	Alnilam	276 31.4	− 1 13.6
25	Alphard	218 39.8	− 8 27.7
41	Alphecca	126 48.2	+26 52.1
1	Alpheratz	358 29.1	+28 50.4
51	Altair	62 50.9	+ 8 44.9
2	Ankaa	353 58.9	−42 32.8
42	Antares	113 20.2	−26 20.1
37	Arcturus	146 35.9	+19 25.2
43	Atria	109 01.3	−68 57.1
22	Avior	234 36.8	−59 21.8
13	Bellatrix	279 19.6	+ 6 18.7
16	Betelg'se	271 49.3	+ 7 24.1
17	Canopus	264 16.3	−52 40.0
12	Capella	281 40.1	+45 57.2
53	Deneb	50 01.2	+45 07.1
28	Denebola	183 18.8	+14 49.6
4	Diphda	349 40.0	−18 13.9
27	Dubhe	194 46.0	+61 59.9
14	Elnath	279 08.7	+28 34.3
47	Eltanin	91 06.2	+51 29.8
54	Enif	34 30.1	+ 9 40.1
56	Fomalhaut	16 12.2	−29 51.5
31	Gacrux	172 50.5	−56 51.9
29	Gienah	176 37.9	−17 17.5
35	Hadar	149 50.7	−60 09.7
6	Hamal	328 50.6	+23 15.0
48	Kaus Aust.	84 41.9	−34 24.5
40	Kochab	137 17.4	+74 20.7
57	Markab	14 22.1	+14 57.7
8	Menkar	315 01.3	+ 3 54.9
36	Menkent	148 59.7	−36 09.1
24	Miapl'dus	221 50.2	−69 31.9
9	Mirfak	309 43.8	+49 42.0
50	Nunki	76 52.6	−26 21.3
52	Peacock	54 28.0	−56 52.9
21	Pollux	244 22.0	+28 08.3
20	Procyon	245 46.2	+ 5 20.6
46	R'alhague	96 47.1	+12 35.6
26	Regulus	208 30.7	+12 11.4
11	Rigel	281 54.7	− 8 15.0
38	Rigil Kent.	140 52.1	−60 39.4
44	Sabik	103 02.9	−15 40.3
3	Schedar	350 30.8	+56 17.2
45	Shaula	97 21.5	−37 04.5
18	Sirius	259 12.9	−16 39.0
33	Spica	159 17.9	−10 55.6
23	Suhail	223 25.4	−43 15.0
49	Vega	81 08.4	+38 44.5
39	Zub'g'bi	137 54.2	−15 51.4

GMT	Equation of Time (App.—Mean) 24	25	26
h	m s	m s	m s
0	− 6 21.4	− 6 22.9	− 6 23.8
6	− 6 21.9	− 6 23.1	− 6 23.9
12	− 6 22.2	− 6 23.4	− 6 24.0
18	− 6 22.6	− 6 23.6	− 6 24.0
24	− 6 22.9	− 6 23.8	− 6 24.1

Lat.	Sunrise	Twlt. begins	Moonrise 24	25	26	27
N °	h m	h m	h m	h m	h m	h m
72	□	□	□	□	□	□
70	□	□	□	□	□	□
68	1 31	////	□	□	□	□
66	2 15	////	20 35	□	□	23 15
64	2 44	////	21 22	21 36	22 32	24 15
62	3 06	////	21 52	22 22	23 21	24 49
60	3 23	////	22 16	22 52	23 52	25 14
58	3 38	////	22 34	23 15	24 15	0 15
56	3 50	////	22 50	23 33	24 34	0 34
54	4 01	////	23 04	23 49	24 50	0 50
52	4 10	0 30	23 16	24 03	0 03	1 03
50	4 19	1 25	23 26	24 14	0 14	1 15
45	4 37	2 24	23 48	24 39	0 39	1 40
40	4 51	2 58	24 06	0 06	0 59	2 00
35	5 04	3 23	24 21	0 21	1 16	2 16
30	5 14	3 42	24 34	0 34	1 30	2 31
20	5 33	4 11	0 04	0 57	1 54	2 55
10	5 48	4 33	0 21	1 16	2 15	3 16
0	6 03	4 50	0 37	1 35	2 35	3 36
10	6 17	5 04	0 52	1 53	2 55	3 55
20	6 33	5 16	1 09	2 13	3 16	4 16
30	6 50	5 28	1 29	2 36	3 41	4 40
35	7 00	5 33	1 40	2 49	3 55	4 55
40	7 12	5 38	1 53	3 05	4 12	5 11
45	7 25	5 43	2 09	3 24	4 32	5 31
50	7 42	5 48	2 29	3 47	4 58	5 56
52	7 50	5 51	2 38	3 59	5 10	6 07
54	7 58	5 52	2 48	4 12	5 24	6 21
56	8 08	5 55	3 00	4 26	5 41	6 37
58	8 19	5 57	3 14	4 44	6 00	6 55
60	8 31	6 00	3 30	5 05	6 25	7 18
S						

Lat.	Sunset	Twlt. ends	Moonset 24	25	26	27
N °	h m	h m	h m	h m	h m	h m
72	□	□	□	□	□	□
70	□	□	□	□	□	□
68	22 36	////	□	□	□	□
66	21 54	////	17 53	□	□	21 32
64	21 26	////	17 07	18 58	20 10	20 31
62	21 05	////	16 37	18 13	19 21	19 57
60	20 48	////	16 14	17 43	18 50	19 32
58	20 34	////	15 56	17 20	18 27	19 11
56	20 22	////	15 41	17 02	18 08	18 55
54	20 11	////	15 28	16 46	17 52	18 40
52	20 02	23 32	15 16	16 33	17 38	18 28
50	19 53	22 43	15 06	16 21	17 26	18 17
45	19 35	21 46	14 45	15 57	17 01	17 54
40	19 21	21 13	14 28	15 37	16 41	17 35
35	19 09	20 49	14 13	15 21	16 24	17 20
30	18 58	20 29	14 01	15 07	16 10	17 06
20	18 40	20 01	13 40	14 43	15 45	16 43
10	18 24	19 39	13 21	14 23	15 24	16 23
0	18 10	19 23	13 04	14 03	15 04	16 04
10	17 56	19 10	12 47	13 44	14 44	15 45
20	17 41	18 58	12 28	13 23	14 23	15 25
30	17 23	18 46	12 07	13 00	13 58	15 01
35	17 13	18 41	11 55	12 45	13 44	14 47
40	17 02	18 37	11 41	12 29	13 27	14 31
45	16 48	18 31	11 24	12 10	13 06	14 12
50	16 32	18 26	11 04	11 46	12 41	13 48
52	16 24	18 24	10 54	11 35	12 28	13 36
54	16 16	18 22	10 43	11 21	12 14	13 22
56	16 06	18 20	10 31	11 06	11 58	13 07
58	15 55	18 17	10 17	10 48	11 38	12 49
60	15 42	18 15	10 00	10 27	11 14	12 26
S						

GMT of Transit
Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
24	6 50	14 51	21 33	10 53	17 59
25	7 49	14 51	21 28	10 50	17 55
26	8 50	14 52	21 24	10 47	17 51
27	9 50	14 52	21 20	10 44	17 47

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.1	0.1	0.3
30			
	0.1	0.1	0.3
45			
	0.1	0.1	0.2
60			
	0.1	0.1	0.1
75			
	0.1	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	24	25	26
°	′	′	′
0			
	18.5	18.3	18.1
4			
	18.5	18.3	18.1
8			
	18.4	18.3	18.1
12			
	18.4	18.3	18.0
16			
	18.4	18.2	18.0
20			
	18.3	18.2	18.0
24			
	18.2	18.1	17.9
28			
	18.2	18.1	17.8
32			
	18.1	18.0	17.8
36			
	18.0	17.9	17.7
40			
	17.9	17.8	17.6
44			
	17.8	17.7	17.5
48			
	17.7	17.6	17.4
52			
	17.5	17.4	17.3
56			
	17.4	17.3	17.2
60			
	17.3	17.2	17.0
64			
	17.1	17.0	16.9
68			
	17.0	16.9	16.8
72			
	16.8	16.8	16.6
76			
	16.7	16.6	16.5
80			
	16.5	16.5	16.4
84			
	16.3	16.3	16.2
88			
	16.2	16.2	16.1
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	24	25	26
°	′	′	′
0			
	13.9	14.0	14.1
4			
	13.9	14.0	14.1
8			
	13.9	14.0	14.1
12			
	13.9	14.0	14.2
16			
	14.0	14.1	14.2
20			
	14.0	14.1	14.2
24			
	14.1	14.2	14.3
28			
	14.2	14.2	14.4
32			
	14.3	14.3	14.4
36			
	14.4	14.4	14.5
40			
	14.5	14.5	14.6
44			
	14.6	14.6	14.7
48			
	14.7	14.7	14.8
52			
	14.8	14.9	14.9
56			
	15.0	15.0	15.0
60			
	15.1	15.1	15.2
64			
	15.2	15.3	15.3
68			
	15.4	15.4	15.4
72			
	15.5	15.5	15.5
76			
	15.7	15.7	15.7
80			
	15.9	15.8	15.8
84			
	16.0	16.0	16.0
88			
	16.1	16.1	16.1
90			

Subtract from table, back cover

GMT		♈	VENUS −3.6		MARS −1.8		JUPITER −1.4		SATURN 0.8		MOON			
	h	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
		° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
27	0	304 08.4	137 06.9	+ 6 30.3	39 04.6	−28 19.8	198 38.3	+22 41.5	92 32.1	−10 14.7	218 25.6	48	+25 04.3	− 21
	1	319 10.9	152 06.9	29.1	54 07.2	19.8	213 40.2	41.5	107 34.5	14.7	232 49.4	49	25 02.2	− 23
	2	334 13.3	167 06.8	27.9	69 09.8	19.8	228 42.1	41.4	122 36.9	14.8	247 13.3	50	24 59.9	− 24
	3	349 15.8	182 06.7	•• 26.6	84 12.3	•• 19.7	243 43.9	•• 41.3	137 39.3	•• 14.8	261 37.3	49	·24 57.5	− 26
	4	4 18.2	197 06.6	25.4	99 14.9	19.7	258 45.8	41.3	152 41.7	14.9	276 01.2	51	24 54.9	− 27
	5	19 20.7	212 06.5	24.2	114 17.5	19.7	273 47.7	41.2	167 44.1	14.9	290 25.3	50	24 52.2	− 29
	6	34 23.2	227 06.4	+ 6 23.0	129 20.0	−28 19.7	288 49.5	+22 41.2	182 46.5	−10 14.9	304 49.3	51	+24 49.3	− 31
	7	49 25.6	242 06.3	21.7	144 22.6	19.6	303 51.4	41.1	197 48.9	15.0	319 13.4	52	24 46.2	− 32
	8	64 28.1	257 06.2	20.5	159 25.1	19.6	318 53.3	41.1	212 51.3	15.0	333 37.6	52	24 43.0	− 34
	9	79 30.6	272 06.1	•• 19.3	174 27.7	•• 19.6	333 55.2	•• 41.0	227 53.6	•• 15.1	348 01.8	53	·24 39.6	− 35
	10	94 33.0	287 06.1	18.1	189 30.3	19.6	348 57.0	41.0	242 56.0	15.1	2 26.1	53	24 36.1	− 37
	11	109 35.5	302 06.0	16.8	204 32.8	19.5	3 58.9	40.9	257 58.4	15.1	16 50.4	54	24 32.4	− 39
	12	124 38.0	317 05.9	+ 6 15.6	219 35.4	−28 19.5	19 00.8	+22 40.9	273 00.8	−10 15.2	31 14.8	54	+24 28.5	− 40
	13	139 40.4	332 05.8	14.4	234 37.9	19.5	34 02.6	40.8	288 03.2	15.2	45 39.2	55	24 24.5	− 42
	14	154 42.9	347 05.7	13.2	249 40.4	19.5	49 04.5	40.7	303 05.6	15.3	60 03.7	56	24 20.3	− 43
	15	169 45.4	2 05.6	•• 11.9	264 43.0	•• 19.4	64 06.4	•• 40.7	318 08.0	•• 15.3	74 28.3	56	·24 16.0	− 45
	16	184 47.8	17 05.5	10.7	279 45.5	19.4	79 08.3	40.6	333 10.4	15.3	88 52.9	57	24 11.5	− 47
	17	199 50.3	32 05.5	09.5	294 48.1	19.4	94 10.1	40.6	348 12.7	15.4	103 17.6	57	24 06.8	− 48
	18	214 52.7	47 05.4	+ 6 08.2	309 50.6	−28 19.3	109 12.0	+22 40.5	3 15.1	−10 15.4	117 42.3	59	+24 02.0	− 49
	19	229 55.2	62 05.3	07.0	324 53.2	19.3	124 13.9	40.5	18 17.5	15.4	132 07.2	58	23 57.1	− 51
	20	244 57.7	77 05.2	05.8	339 55.7	19.3	139 15.8	40.4	33 19.9	15.5	146 32.0	60	23 52.0	− 52
	21	260 00.1	92 05.1	•• 04.6	354 58.2	•• 19.3	154 17.6	•• 40.4	48 22.3	•• 15.5	160 57.0	60	·23 46.8	− 54
	22	275 02.6	107 05.0	03.3	10 00.8	19.2	169 19.5	40.3	63 24.7	15.6	175 22.0	61	23 41.4	− 55
	23	290 05.1	122 05.0	02.1	25 03.3	19.2	184 21.4	40.2	78 27.1	15.6	189 47.1	62	23 35.9	− 57
28	0	305 07.5	137 04.9	+ 6 00.9	40 05.8	−28 19.2	199 23.2	+22 40.2	93 29.4	−10 15.6	204 12.3	62	+23 30.2	− 58
	1	320 10.0	152 04.8	5 59.6	55 08.3	19.2	214 25.1	40.1	108 31.8	15.7	218 37.5	64	23 24.4	− 60
	2	335 12.5	167 04.7	58.4	70 10.9	19.1	229 27.0	40.1	123 34.2	15.7	233 02.9	64	23 18.4	− 61
	3	350 14.9	182 04.6	•• 57.2	85 13.4	•• 19.1	244 28.9	•• 40.0	138 36.6	•• 15.8	247 28.3	65	·23 12.3	− 63
	4	5 17.4	197 04.6	56.0	100 15.9	19.1	259 30.7	40.0	153 39.0	15.8	261 53.8	65	23 06.0	− 64
	5	20 19.9	212 04.5	54.7	115 18.4	19.1	274 32.6	39.9	168 41.4	15.8	276 19.3	67	22 59.6	− 65
	6	35 22.3	227 04.4	+ 5 53.5	130 21.0	−28 19.0	289 34.5	+22 39.9	183 43.8	−10 15.9	290 45.0	67	+22 53.1	− 66
	7	50 24.8	242 04.3	52.3	145 23.5	19.0	304 36.4	39.8	198 46.1	15.9	305 10.7	68	22 46.5	− 68
	8	65 27.2	257 04.3	51.0	160 26.0	19.0	319 38.2	39.8	213 48.5	16.0	319 36.5	69	22 39.7	− 70
	9	80 29.7	272 04.2	•• 49.8	175 28.5	•• 18.9	334 40.1	•• 39.7	228 50.9	•• 16.0	334 02.4	70	·22 32.7	− 70
	10	95 32.2	287 04.1	48.6	190 31.0	18.9	349 42.0	39.6	243 53.3	16.0	348 28.4	70	22 25.7	− 72
	11	110 34.6	302 04.0	47.3	205 33.5	18.9	4 43.8	39.6	258 55.7	16.1	2 54.4	72	22 18.5	− 74
	12	125 37.1	317 03.9	+ 5 46.1	220 36.0	−28 18.9	19 45.7	+22 39.5	273 58.1	−10 16.1	17 20.6	72	+22 11.1	− 74
	13	140 39.6	332 03.9	44.9	235 38.6	18.8	34 47.6	39.5	289 00.4	16.2	31 46.8	74	22 03.7	− 76
	14	155 42.0	347 03.8	43.6	250 41.1	18.8	49 49.5	39.4	304 02.8	16.2	46 13.2	74	21 56.1	− 77
	15	170 44.5	2 03.7	•• 42.4	265 43.6	•• 18.8	64 51.3	•• 39.4	319 05.2	•• 16.2	60 39.6	75	·21 48.4	− 78
	16	185 47.0	17 03.6	41.2	280 46.1	18.8	79 53.2	39.3	334 07.6	16.3	75 06.1	76	21 40.6	− 80
	17	200 49.4	32 03.6	39.9	295 48.6	18.7	94 55.1	39.3	349 10.0	16.3	89 32.7	77	21 32.6	− 81
	18	215 51.9	47 03.5	+ 5 38.7	310 51.1	−28 18.7	109 57.0	+22 39.2	4 12.4	−10 16.4	103 59.4	77	+21 24.5	− 82
	19	230 54.3	62 03.4	37.5	325 53.6	18.7	124 58.8	39.1	19 14.7	16.4	118 26.1	79	21 16.3	− 83
	20	245 56.8	77 03.4	36.2	340 56.1	18.6	140 00.7	39.1	34 17.1	16.4	132 53.0	80	21 08.0	− 84
	21	260 59.3	92 03.3	•• 35.0	355 58.6	•• 18.6	155 02.6	•• 39.0	49 19.5	•• 16.5	147 20.0	80	·20 59.6	− 86
	22	276 01.7	107 03.2	33.8	11 01.1	18.6	170 04.5	39.0	64 21.9	16.5	161 47.0	82	20 51.0	− 87
	23	291 04.2	122 03.1	32.5	26 03.5	18.6	185 06.3	38.9	79 24.3	16.6	176 14.2	82	20 42.3	− 87
29	0	306 06.7	137 03.1	+ 5 31.3	41 06.0	−28 18.5	200 08.2	+22 38.9	94 26.7	−10 16.6	190 41.4	83	+20 33.6	− 89
	1	321 09.1	152 03.0	30.1	56 08.5	18.5	215 10.1	38.8	109 29.0	16.6	205 08.7	85	20 24.7	− 90
	2	336 11.6	167 02.9	28.8	71 11.0	18.5	230 12.0	38.8	124 31.4	16.7	219 36.2	85	20 15.7	− 91
	3	351 14.1	182 02.9	•• 27.6	86 13.5	•• 18.4	245 13.8	•• 38.7	139 33.8	•• 16.7	234 03.7	86	·20 06.6	− 93
	4	6 16.5	197 02.8	26.4	101 16.0	18.4	260 15.7	38.6	154 36.2	16.8	248 31.3	87	19 57.3	− 93
	5	21 19.0	212 02.7	25.1	116 18.5	18.4	275 17.6	38.6	169 38.6	16.8	262 59.0	88	19 48.0	− 94
	6	36 21.5	227 02.7	+ 5 23.9	131 20.9	−28 18.4	290 19.5	+22 38.5	184 40.9	−10 16.9	277 26.8	89	+19 38.6	− 95
	7	51 23.9	242 02.6	22.7	146 23.4	18.3	305 21.3	38.5	199 43.3	16.9	291 54.7	90	19 29.1	− 97
	8	66 26.4	257 02.5	21.4	161 25.9	18.3	320 23.2	38.4	214 45.7	16.9	306 22.7	91	19 19.4	− 97
	9	81 28.8	272 02.5	•• 20.2	176 28.4	•• 18.3	335 25.1	•• 38.4	229 48.1	•• 17.0	320 50.8	92	·19 09.7	− 98
	10	96 31.3	287 02.4	19.0	191 30.8	18.2	350 27.0	38.3	244 50.5	17.0	335 19.0	93	18 59.9	−100
	11	111 33.8	302 02.3	17.7	206 33.3	18.2	5 28.8	38.2	259 52.8	17.1	349 47.3	93	18 49.9	−100
	12	126 36.2	317 02.3	+ 5 16.5	221 35.8	−28 18.2	20 30.7	+22 38.2	274 55.2	−10 17.1	4 15.6	95	+18 39.9	−101
	13	141 38.7	332 02.2	15.3	236 38.2	18.1	35 32.6	38.1	289 57.6	17.1	18 44.1	96	18 29.8	−102
	14	156 41.2	347 02.1	14.0	251 40.7	18.1	50 34.5	38.1	305 00.0	17.2	33 12.7	96	18 19.6	−103
	15	171 43.6	2 02.1	•• 12.8	266 43.2	•• 18.1	65 36.3	•• 38.0	320 02.4	•• 17.2	47 41.3	98	·18 09.3	−104
	16	186 46.1	17 02.0	11.5	281 45.6	18.1	80 38.2	38.0	335 04.7	17.3	62 10.1	98	17 58.9	−105
	17	201 48.6	32 01.9	10.3	296 48.1	18.0	95 40.1	37.9	350 07.1	17.3	76 38.9	100	17 48.4	−105
	18	216 51.0	47 01.9	+ 5 09.1	311 50.6	−28 18.0	110 42.0	+22 37.9	5 09.5	−10 17.4	91 07.9	100	+17 37.9	−107
	19	231 53.5	62 01.8	07.8	326 53.0	18.0	125 43.8	37.8	20 11.9	17.4	105 36.9	101	17 27.2	−107
	20	246 56.0	77 01.8	06.6	341 55.5	17.9	140 45.7	37.7	35 14.3	17.4	120 06.0	103	17 16.5	−108
	21	261 58.4	92 01.7	•• 05.3	356 57.9	•• 17.9	155 47.6	•• 37.7	50 16.6	•• 17.5	134 35.3	103	·17 05.7	−109
	22	277 00.9	107 01.6	04.1	12 00.4	17.9	170 49.5	37.6	65 19.0	17.5	149 04.6	104	16 54.8	−110
	23	292 03.3	122 01.6	02.9	27 02.8	17.8	185 51.3	37.6	80 21.4	17.6	163 34.0	105	16 43.8	−110
	24	307 05.8	137 01.5	+ 5 01.6	42 05.3	−28 17.8	200 53.2	+22 37.5	95 23.8	−10 17.6	178 03.5	106	+16 32.8	−112
	code	—	0	− 12	+ 26	+ 1	+ 19	0	+ 23	− 1				

GMT		SUN GHA	SUN Dec.
	h	° ′	° ′
27	0	178 24.0	+19 23.6
	1	193 24.0	23.0
	2	208 24.0	22.5
	3	223 24.0	·· 21.9
	4	238 24.0	21.3
	5	253 24.0	20.8
	6	268 24.0	+19 20.2
	7	283 24.0	19.7
	8	298 24.0	19.1
	9	313 24.0	·· 18.5
	10	328 24.0	18.0
	11	343 24.0	17.4
	12	358 24.0	+19 16.9
	13	13 24.0	16.3
	14	28 24.0	15.7
	15	43 24.0	·· 15.2
	16	58 24.0	14.6
	17	73 24.0	14.0
	18	88 24.0	+19 13.5
	19	103 24.0	12.9
	20	118 24.0	12.3
	21	133 24.0	·· 11.8
	22	148 24.0	11.2
	23	163 24.1	10.6
28	0	178 24.1	+19 10.1
	1	193 24.1	09.5
	2	208 24.1	08.9
	3	223 24.1	·· 08.4
	4	238 24.1	07.8
	5	253 24.1	07.2
	6	268 24.1	+19 06.6
	7	283 24.1	06.1
	8	298 24.1	05.5
	9	313 24.1	·· 04.9
	10	328 24.1	04.4
	11	343 24.1	03.8
	12	358 24.2	+19 03.2
	13	13 24.2	02.6
	14	28 24.2	02.1
	15	43 24.2	·· 01.5
	16	58 24.2	00.9
	17	73 24.2	19 00.3
	18	88 24.2	+18 59.7
	19	103 24.2	59.2
	20	118 24.2	58.6
	21	133 24.2	·· 58.0
	22	148 24.3	57.4
	23	163 24.3	56.8
29	0	178 24.3	+18 56.3
	1	193 24.3	55.7
	2	208 24.3	55.1
	3	223 24.3	·· 54.5
	4	238 24.3	53.9
	5	253 24.4	53.3
	6	268 24.4	+18 52.8
	7	283 24.4	52.2
	8	298 24.4	51.6
	9	313 24.4	·· 51.0
	10	328 24.4	50.4
	11	343 24.4	49.8
	12	358 24.5	+18 49.2
	13	13 24.5	48.7
	14	28 24.5	48.1
	15	43 24.5	·· 47.5
	16	58 24.5	46.9
	17	73 24.5	46.3
	18	88 24.6	+18 45.7
	19	103 24.6	45.1
	20	118 24.6	44.5
	21	133 24.6	·· 43.9
	22	148 24.6	43.3
	23	163 24.6	42.7
	24	178 24.7	+18 42.1
code		—	− 6

STARS

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.8	−40 28.8
5	Achernar	335 59.3	−57 27.6
30	Acrux	173 59.2	−62 51.2
19	Adhara	255 47.6	−28 54.4
10	Aldebaran	291 40.2	+16 25.2
32	Alioth	166 59.4	+56 12.6
34	Alkaid	153 33.5	+49 32.6
55	Al Na'ir	28 38.5	−47 10.7
15	Alnilam	276 31.4	− 1 13.6
25	Alphard	218 39.7	− 8 27.7
41	Alphecca	126 48.2	+26 52.1
1	Alpheratz	358 29.0	+28 50.4
51	Altair	62 50.9	+ 8 44.9
2	Ankaa	353 58.9	−42 32.8
42	Antares	113 20.2	−26 20.1
37	Arcturus	146 35.9	+19 25.2
43	Atria	109 01.4	−68 57.1
22	Avior	234 36.8	−59 21.8
13	Bellatrix	279 19.6	+ 6 18.7
16	Betelg'se	271 49.3	+ 7 24.1
17	Canopus	264 16.2	−52 40.0
12	Capella	281 40.0	+45 57.2
53	Deneb	50 01.1	+45 07.1
28	Denebola	183 18.8	+14 49.6
4	Diphda	349 39.9	−18 13.8
27	Dubhe	194 46.0	+61 59.9
14	Elnath	279 08.7	+28 34.3
47	Eltanin	91 06.2	+51 29.8
54	Enif	34 30.1	+ 9 40.1
56	Fomalhaut	16 12.2	−29 51.5
31	Gacrux	172 50.5	−56 51.9
29	Gienah	176 37.9	−17 17.5
35	Hadar	149 50.7	−60 09.7
6	Hamal	328 50.6	+23 15.0
48	Kaus Aust.	84 41.9	−34 24.5
40	Kochab	137 17.5	+74 20.7
57	Markab	14 22.1	+14 57.8
8	Menkar	315 01.3	+ 3 54.9
36	Menkent	148 59.7	−36 09.1
24	Miapl'dus	221 50.3	−69 31.9
9	Mirfak	309 43.8	+49 42.0
50	Nunki	76 52.6	−26 21.3
52	Peacock	54 28.0	−56 52.9
21	Pollux	244 22.0	+28 08.3
20	Procyon	245 46.2	+ 5 20.6
46	R'alhague	96 47.1	+12 35.6
26	Regulus	208 30.7	+12 11.4
11	Rigel	281 54.7	− 8 15.0
38	Rigil Kent.	140 52.2	−60 39.4
44	Sabik	103 02.9	−15 40.3
3	Schedar	350 30.8	+56 17.2
45	Shaula	97 21.5	−37 04.5
18	Sirius	259 12.9	−16 39.0
33	Spica	159 17.9	−10 55.6
23	Suhail	223 25.4	−43 15.0
49	Vega	81 08.5	+38 44.6
39	Zub'g'bi	137 54.3	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 27	Moonrise 28	Moonrise 29	Moonrise 30
N °	h m	h m	h m	h m	h m	h m
72	▭	▭	▭	▭	▭	2 03
70	0 17	////	▭	▭	▭	2 47
68	1 50	////	▭	▭	0 54	3 16
66	2 27	////	23 15	25 38	1 38	3 38
64	2 54	////	24 15	0 15	2 07	3 55
62	3 14	////	24 49	0 49	2 29	4 09
60	3 30	////	25 14	1 14	2 47	4 21
58	3 44	////	0 15	1 34	3 02	4 31
56	3 55	////	0 34	1 50	3 14	4 40
54	4 06	////	0 50	2 04	3 25	4 48
52	4 15	0 56	1 03	2 16	3 35	4 55
50	4 23	1 36	1 15	2 27	3 43	5 01
45	4 40	2 29	1 40	2 49	4 02	5 15
40	4 54	3 02	2 00	3 07	4 16	5 26
35	5 06	3 26	2 16	3 22	4 29	5 35
30	5 16	3 44	2 31	3 35	4 40	5 43
20	5 34	4 13	2 55	3 57	4 58	5 57
10	5 49	4 34	3 16	4 16	5 15	6 10
0	6 03	4 50	3 36	4 34	5 30	6 21
10	6 17	5 04	3 55	4 52	5 45	6 33
20	6 32	5 15	4 16	5 11	6 01	6 45
30	6 48	5 26	4 40	5 33	6 19	6 59
35	6 58	5 31	4 55	5 46	6 30	7 07
40	7 09	5 36	5 11	6 01	6 42	7 16
45	7 22	5 40	5 31	6 18	6 56	7 26
50	7 38	5 45	5 56	6 40	7 13	7 39
52	7 45	5 48	6 07	6 50	7 22	7 45
54	7 53	5 49	6 21	7 02	7 31	7 52
56	8 02	5 51	6 37	7 15	7 41	7 59
58	8 13	5 53	6 55	7 30	7 52	8 07
60 S	8 25	5 55	7 18	7 48	8 06	8 16

Lat.	Sunset	Twlt. ends	Moonset 27	Moonset 28	Moonset 29	Moonset 30
N °	h m	h m	h m	h m	h m	h m
72	▭	▭	▭	▭	22 34	21 37
70	23 28	////	▭	▭	21 48	21 16
68	22 18	////	▭	21 51	21 17	21 00
66	21 42	////	21 32	21 06	20 55	20 46
64	21 17	////	20 31	20 36	20 36	20 35
62	20 57	////	19 57	20 13	20 21	20 26
60	20 41	////	19 32	19 55	20 09	20 18
58	20 28	////	19 11	19 40	19 58	20 10
56	20 16	////	18 55	19 26	19 48	20 04
54	20 06	////	18 40	19 15	19 40	19 58
52	19 57	23 10	18 28	19 05	19 32	19 53
50	19 49	22 32	18 17	18 56	19 25	19 48
45	19 32	21 41	17 54	18 36	19 10	19 38
40	19 18	21 09	17 35	18 21	18 58	19 29
35	19 07	20 46	17 20	18 07	18 47	19 22
30	18 56	20 27	17 06	17 56	18 38	19 15
20	18 39	19 59	16 43	17 35	18 22	19 04
10	18 24	19 39	16 23	17 18	18 08	18 54
0	18 10	19 23	16 04	17 01	17 55	18 44
10	17 56	19 09	15 45	16 45	17 41	18 35
20	17 42	18 58	15 25	16 27	17 27	18 24
30	17 25	18 48	15 01	16 06	17 11	18 13
35	17 15	18 43	14 47	15 54	17 01	18 06
40	17 05	18 39	14 31	15 40	16 50	17 58
45	16 52	18 34	14 12	15 23	16 37	17 49
50	16 36	18 29	13 48	15 03	16 20	17 37
52	16 29	18 28	13 36	14 53	16 13	17 32
54	16 21	18 26	13 22	14 41	16 04	17 26
56	16 11	18 24	13 07	14 29	15 55	17 20
58	16 01	18 22	12 49	14 14	15 44	17 13
60 S	15 49	18 20	12 26	13 56	15 31	17 04

Equation of Time (App.—Mean)

GMT	27	28	29
h	m s	m s	m s
0	− 6 24.1	− 6 23.8	− 6 22.9
6	− 6 24.0	− 6 23.6	− 6 22.6
12	− 6 24.0	− 6 23.4	− 6 22.2
18	− 6 23.9	− 6 23.2	− 6 21.8
24	− 6 23.8	− 6 22.9	− 6 21.4

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
27	9 50	14 52	21 20	10 44	17 47
28	10 48	14 52	21 16	10 41	17 43
29	11 42	14 52	21 12	10 38	17 39
30	12 33	14 52	21 08	10 35	17 36

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.1	0.1	0.3
30			
	0.1	0.1	0.2
45			
	0.1	0.1	0.2
60			
	0.1	0.1	0.1
75			
	0.1	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	27	28	29
°	′	′	′
0			
	17.6	17.1	16.4
4			
	17.6	17.1	16.4
8			
	17.6	17.1	16.4
12			
	17.5	17.0	16.4
16			
	17.5	17.0	16.4
20			
	17.5	17.0	16.4
24			
	17.4	17.0	16.4
28			
	17.4	16.9	16.3
32			
	17.3	16.9	16.3
36			
	17.2	16.8	16.3
40			
	17.2	16.8	16.3
44			
	17.1	16.7	16.2
48			
	17.0	16.6	16.2
52			
	16.9	16.6	16.2
56			
	16.8	16.5	16.1
60			
	16.7	16.4	16.1
64			
	16.6	16.4	16.0
68			
	16.5	16.3	16.0
72			
	16.4	16.2	15.9
76			
	16.3	16.1	15.9
80			
	16.2	16.0	15.8
84			
	16.1	16.0	15.8
88			
	16.0	15.9	15.8
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	27	28	29
°	′	′	′
0			
	14.4	14.7	15.0
4			
	14.4	14.7	15.0
8			
	14.4	14.7	15.1
12			
	14.4	14.7	15.1
16			
	14.5	14.7	15.1
20			
	14.5	14.8	15.1
24			
	14.5	14.8	15.1
28			
	14.6	14.8	15.1
32			
	14.7	14.9	15.2
36			
	14.7	14.9	15.2
40			
	14.8	15.0	15.2
44			
	14.9	15.0	15.3
48			
	15.0	15.1	15.3
52			
	15.0	15.2	15.3
56			
	15.1	15.2	15.4
60			
	15.2	15.3	15.4
64			
	15.3	15.4	15.5
68			
	15.4	15.5	15.5
72			
	15.5	15.5	15.5
76			
	15.7	15.6	15.6
80			
	15.8	15.7	15.6
84			
	15.9	15.8	15.7
88			
	16.0	15.9	15.7
90			

Subtract from table, back cover

New Moon 29

GMT		♈ GHA	VENUS −3.6 GHA	VENUS Dec.	MARS −1.7 GHA	MARS Dec.	JUPITER −1.4 GHA	JUPITER Dec.	SATURN 0.9 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
30	0	307 05.8	137 01.5	+ 5 01.6	42 05.3	−28 17.8	200 53.2	+22 37.5	95 23.8	−10 17.6	178 03.5	106	+16 32.8	−112
	1	322 08.3	152 01.5	5 00.4	57 07.7	17.8	215 55.1	37.5	110 26.2	17.6	192 33.1	107	16 21.6	−112
	2	337 10.7	167 01.4	4 59.2	72 10.2	17.8	230 57.0	37.4	125 28.5	17.7	207 02.8	107	16 10.4	−113
	3	352 13.2	182 01.3	•• 57.9	87 12.6	•• 17.7	245 58.8	•• 37.3	140 30.9	•• 17.7	221 32.5	109	•15 59.1	−113
	4	7 15.7	197 01.3	56.7	102 15.1	17.7	261 00.7	37.3	155 33.3	17.8	236 02.4	110	15 47.8	−114
	5	22 18.1	212 01.2	55.4	117 17.5	17.7	276 02.6	37.2	170 35.7	17.8	250 32.4	110	15 36.4	−115
	6	37 20.6	227 01.2	+ 4 54.2	132 19.9	−28 17.6	291 04.5	+22 37.2	185 38.0	−10 17.9	265 02.4	111	+15 24.9	−116
	7	52 23.1	242 01.1	53.0	147 22.4	17.6	306 06.4	37.1	200 40.4	17.9	279 32.5	113	15 13.3	−116
	8	67 25.5	257 01.1	51.7	162 24.8	17.6	321 08.2	37.1	215 42.8	17.9	294 02.8	113	15 01.7	−117
	9	82 28.0	272 01.0	•• 50.5	177 27.2	•• 17.5	336 10.1	•• 37.0	230 45.2	•• 18.0	308 33.1	114	•14 50.0	−117
	10	97 30.5	287 00.9	49.2	192 29.7	17.5	351 12.0	36.9	245 47.5	18.0	323 03.5	114	14 38.3	−118
	11	112 32.9	302 00.9	48.0	207 32.1	17.5	6 13.9	36.9	260 49.9	18.1	337 33.9	116	14 26.5	−119
	12	127 35.4	317 00.8	+ 4 46.7	222 34.5	−28 17.4	21 15.7	+22 36.8	275 52.3	−10 18.1	352 04.5	117	+14 14.6	−119
	13	142 37.8	332 00.8	45.5	237 37.0	17.4	36 17.6	36.8	290 54.7	18.2	6 35.2	117	14 02.7	−120
	14	157 40.3	347 00.7	44.3	252 39.4	17.4	51 19.5	36.7	305 57.1	18.2	21 05.9	118	13 50.7	−121
	15	172 42.8	2 00.7	•• 43.0	267 41.8	•• 17.3	66 21.4	•• 36.7	320 59.4	•• 18.2	35 36.7	119	•13 38.6	−121
	16	187 45.2	17 00.6	41.8	282 44.2	17.3	81 23.3	36.6	336 01.8	18.3	50 07.6	120	13 26.5	−121
	17	202 47.7	32 00.6	40.5	297 46.7	17.3	96 25.1	36.6	351 04.2	18.3	64 38.6	121	13 14.4	−122
	18	217 50.2	47 00.5	+ 4 39.3	312 49.1	−28 17.3	111 27.0	+22 36.5	6 06.6	−10 18.4	79 09.7	122	+13 02.2	−123
	19	232 52.6	62 00.5	38.1	327 51.5	17.2	126 28.9	36.4	21 08.9	18.4	93 40.9	122	12 49.9	−123
	20	247 55.1	77 00.4	36.8	342 53.9	17.2	141 30.8	36.4	36 11.3	18.5	108 12.1	123	12 37.6	−123
	21	262 57.6	92 00.4	•• 35.6	357 56.3	•• 17.2	156 32.6	•• 36.3	51 13.7	•• 18.5	122 43.4	124	•12 25.3	−124
	22	278 00.0	107 00.3	34.3	12 58.7	17.1	171 34.5	36.3	66 16.1	18.5	137 14.8	125	12 12.9	−125
	23	293 02.5	122 00.3	33.1	28 01.2	17.1	186 36.4	36.2	81 18.4	18.6	151 46.3	125	12 00.4	−125
31	0	308 05.0	137 00.2	+ 4 31.8	43 03.6	−28 17.1	201 38.3	+22 36.1	96 20.8	−10 18.6	166 17.8	126	+11 47.9	−125
	1	323 07.4	152 00.2	30.6	58 06.0	17.0	216 40.2	36.1	111 23.2	18.7	180 49.4	127	11 35.4	−126
	2	338 09.9	167 00.1	29.4	73 08.4	17.0	231 42.0	36.0	126 25.6	18.7	195 21.1	128	11 22.8	−126
	3	353 12.3	182 00.1	•• 28.1	88 10.8	•• 17.0	246 43.9	•• 36.0	141 27.9	•• 18.8	209 52.9	129	•11 10.2	−127
	4	8 14.8	197 00.0	26.9	103 13.2	16.9	261 45.8	35.9	156 30.3	18.8	224 24.8	129	10 57.5	−127
	5	23 17.3	212 00.0	25.6	118 15.6	16.9	276 47.7	35.9	171 32.7	18.8	238 56.7	130	10 44.8	−127
	6	38 19.7	226 59.9	+ 4 24.4	133 18.0	−28 16.9	291 49.5	+22 35.8	186 35.0	−10 18.9	253 28.7	130	+10 32.1	−128
	7	53 22.2	241 59.9	23.1	148 20.4	16.8	306 51.4	35.7	201 37.4	18.9	268 00.7	132	10 19.3	−128
	8	68 24.7	256 59.8	21.9	163 22.8	16.8	321 53.3	35.7	216 39.8	19.0	282 32.9	132	10 06.5	−128
	9	83 27.1	271 59.8	•• 20.6	178 25.2	•• 16.8	336 55.2	•• 35.6	231 42.2	•• 19.0	297 05.1	133	• 9 53.7	−129
	10	98 29.6	286 59.7	19.4	193 27.6	16.7	351 57.1	35.6	246 44.5	19.1	311 37.4	133	9 40.8	−129
	11	113 32.1	301 59.7	18.2	208 30.0	16.7	6 58.9	35.5	261 46.9	19.1	326 09.7	134	9 27.9	−129
	12	128 34.5	316 59.6	+ 4 16.9	223 32.3	−28 16.7	22 00.8	+22 35.5	276 49.3	−10 19.2	340 42.1	135	+ 9 15.0	−130
	13	143 37.0	331 59.6	15.7	238 34.7	16.6	37 02.7	35.4	291 51.7	19.2	355 14.6	135	9 02.0	−130
	14	158 39.4	346 59.6	14.4	253 37.1	16.6	52 04.6	35.3	306 54.0	19.2	9 47.1	136	8 49.0	−130
	15	173 41.9	1 59.5	•• 13.2	268 39.5	•• 16.6	67 06.5	•• 35.3	321 56.4	•• 19.3	24 19.7	137	• 8 36.0	−130
	16	188 44.4	16 59.5	11.9	283 41.9	16.5	82 08.3	35.2	336 58.8	19.3	38 52.4	137	8 23.0	−131
	17	203 46.8	31 59.4	10.7	298 44.3	16.5	97 10.2	35.2	352 01.1	19.4	53 25.1	138	8 09.9	−131
	18	218 49.3	46 59.4	+ 4 09.4	313 46.6	−28 16.5	112 12.1	+22 35.1	7 03.5	−10 19.4	67 57.9	139	+ 7 56.8	−131
	19	233 51.8	61 59.3	08.2	328 49.0	16.4	127 14.0	35.1	22 05.9	19.5	82 30.8	139	7 43.7	−131
	20	248 54.2	76 59.3	06.9	343 51.4	16.4	142 15.8	35.0	37 08.3	19.5	97 03.7	140	7 30.6	−132
	21	263 56.7	91 59.3	•• 05.7	358 53.8	•• 16.4	157 17.7	•• 34.9	52 10.6	•• 19.5	111 36.7	140	• 7 17.4	−131
	22	278 59.2	106 59.2	04.4	13 56.1	16.3	172 19.6	34.9	67 13.0	19.6	126 09.7	141	7 04.3	−132
	23	294 01.6	121 59.2	03.2	28 58.5	16.3	187 21.5	34.8	82 15.4	19.6	140 42.8	141	6 51.1	−132
1	0	309 04.1	136 59.1	+ 4 02.0	44 00.9	−28 16.3	202 23.4	+22 34.8	97 17.7	−10 19.7	155 15.9	142	+ 6 37.9	−132
	1	324 06.6	151 59.1	4 00.7	59 03.2	16.2	217 25.2	34.7	112 20.1	19.7	169 49.1	143	6 24.7	−133
	2	339 09.0	166 59.1	3 59.5	74 05.6	16.2	232 27.1	34.7	127 22.5	19.8	184 22.4	143	6 11.4	−132
	3	354 11.5	181 59.0	•• 58.2	89 08.0	•• 16.2	247 29.0	•• 34.6	142 24.9	•• 19.8	198 55.7	143	• 5 58.2	−133
	4	9 13.9	196 59.0	57.0	104 10.3	16.1	262 30.9	34.5	157 27.2	19.9	213 29.0	145	5 44.9	−133
	5	24 16.4	211 58.9	55.7	119 12.7	16.1	277 32.8	34.5	172 29.6	19.9	228 02.5	144	5 31.6	−132
	6	39 18.9	226 58.9	+ 3 54.5	134 15.1	−28 16.1	292 34.6	+22 34.4	187 32.0	−10 20.0	242 35.9	145	+ 5 18.4	−133
	7	54 21.3	241 58.9	53.2	149 17.4	16.0	307 36.5	34.4	202 34.3	20.0	257 09.4	146	5 05.1	−133
	8	69 23.8	256 58.8	52.0	164 19.8	16.0	322 38.4	34.3	217 36.7	20.0	271 43.0	146	4 51.8	−133
	9	84 26.3	271 58.8	•• 50.7	179 22.1	•• 16.0	337 40.3	•• 34.2	232 39.1	•• 20.1	286 16.6	146	• 4 38.5	−133
	10	99 28.7	286 58.8	49.5	194 24.5	15.9	352 42.2	34.2	247 41.4	20.1	300 50.2	147	4 25.2	−134
	11	114 31.2	301 58.7	48.2	209 26.8	15.9	7 44.1	34.1	262 43.8	20.2	315 23.9	147	4 11.8	−133
	12	129 33.7	316 58.7	+ 3 47.0	224 29.2	−28 15.8	22 45.9	+22 34.1	277 46.2	−10 20.2	329 57.6	148	+ 3 58.5	−133
	13	144 36.1	331 58.7	45.7	239 31.5	15.8	37 47.8	34.0	292 48.5	20.3	344 31.4	148	3 45.2	−133
	14	159 38.6	346 58.6	44.5	254 33.9	15.8	52 49.7	34.0	307 50.9	20.3	359 05.2	149	3 31.9	−134
	15	174 41.1	1 58.6	•• 43.2	269 36.2	•• 15.7	67 51.6	•• 33.9	322 53.3	•• 20.4	13 39.1	149	• 3 18.5	−133
	16	189 43.5	16 58.5	42.0	284 38.6	15.7	82 53.5	33.8	337 55.7	20.4	28 13.0	150	3 05.2	−133
	17	204 46.0	31 58.5	40.7	299 40.9	15.7	97 55.3	33.8	352 58.0	20.4	42 47.0	149	2 51.9	−134
	18	219 48.4	46 58.5	+ 3 39.5	314 43.2	−28 15.6	112 57.2	+22 33.7	8 00.4	−10 20.5	57 20.9	150	+ 2 38.5	−133
	19	234 50.9	61 58.5	38.2	329 45.6	15.6	127 59.1	33.7	23 02.8	20.5	71 54.9	151	2 25.2	−133
	20	249 53.4	76 58.4	37.0	344 47.9	15.6	143 01.0	33.6	38 05.1	20.6	86 29.0	151	2 11.9	−133
	21	264 55.8	91 58.4	•• 35.7	359 50.2	•• 15.5	158 02.9	•• 33.5	53 07.5	•• 20.6	101 03.1	151	• 1 58.6	−133
	22	279 58.3	106 58.4	34.5	14 52.6	15.5	173 04.7	33.5	68 09.9	20.7	115 37.2	152	1 45.3	−134
	23	295 00.8	121 58.3	33.2	29 54.9	15.5	188 06.6	33.4	83 12.2	20.7	130 11.4	151	1 31.9	−133
	24	310 03.2	136 58.3	+ 3 32.0	44 57.2	−28 15.4	203 08.5	+22 33.4	98 14.6	−10 20.8	144 45.5	153	+ 1 18.6	−133
code		—	0	− 12	+ 24	+ 1	+ 19	− 1	+ 24	0				

GMT		SUN GHA	Dec.
	h	° ′	° ′
30	0	178 24.7	+18 42.1
	1	193 24.7	41.5
	2	208 24.7	41.0
	3	223 24.7	·· 40.4
	4	238 24.7	39.8
	5	253 24.8	39.2
	6	268 24.8	+18 38.6
	7	283 24.8	38.0
	8	298 24.8	37.4
	9	313 24.8	·· 36.8
	10	328 24.9	36.2
	11	343 24.9	35.6
	12	358 24.9	+18 35.0
	13	13 24.9	34.4
	14	28 24.9	33.8
	15	43 25.0	·· 33.2
	16	58 25.0	32.6
	17	73 25.0	31.9
	18	88 25.0	+18 31.3
	19	103 25.1	30.7
	20	118 25.1	30.1
	21	133 25.1	·· 29.5
	22	148 25.1	28.9
	23	163 25.2	28.3
31	0	178 25.2	+18 27.7
	1	193 25.2	27.1
	2	208 25.2	26.5
	3	223 25.3	·· 25.9
	4	238 25.3	25.3
	5	253 25.3	24.7
	6	268 25.3	+18 24.1
	7	283 25.4	23.4
	8	298 25.4	22.8
	9	313 25.4	·· 22.2
	10	328 25.4	21.6
	11	343 25.5	21.0
	12	358 25.5	+18 20.4
	13	13 25.5	19.8
	14	28 25.6	19.2
	15	43 25.6	·· 18.5
	16	58 25.6	17.9
	17	73 25.6	17.3
	18	88 25.7	+18 16.7
	19	103 25.7	16.1
	20	118 25.7	15.5
	21	133 25.8	·· 14.8
	22	148 25.8	14.2
	23	163 25.8	13.6
1	0	178 25.9	+18 13.0
	1	193 25.9	12.4
	2	208 25.9	11.7
	3	223 26.0	·· 11.1
	4	238 26.0	10.5
	5	253 26.0	09.9
	6	268 26.1	+18 09.2
	7	283 26.1	08.6
	8	298 26.1	08.0
	9	313 26.2	·· 07.4
	10	328 26.2	06.8
	11	343 26.2	06.1
	12	358 26.3	+18 05.5
	13	13 26.3	04.9
	14	28 26.3	04.2
	15	43 26.4	·· 03.6
	16	58 26.4	03.0
	17	73 26.4	02.4
	18	88 26.5	+18 01.7
	19	103 26.5	01.1
	20	118 26.5	18 00.5
	21	133 26.6	·17 59.8
	22	148 26.6	59.2
	23	163 26.7	58.6
	24	178 26.7	+17 57.9
code		—	− 6

STARS No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.8	−40 28.8
5	Achernar	335 59.3	−57 27.6
30	Acrux	173 59.2	−62 51.2
19	Adhara	255 47.6	−28 54.4
10	Aldebaran	291 40.2	+16 25.3
32	Alioth	166 59.4	+56 12.5
34	Alkaid	153 33.6	+49 32.5
55	Al Na'ir	28 38.5	−47 10.7
15	Alnilam	276 31.4	− 1 13.6
25	Alphard	218 39.7	− 8 27.7
41	Alphecca	126 48.2	+26 52.1
1	Alpheratz	358 29.0	+28 50.4
51	Altair	62 50.9	+ 8 44.9
2	Ankaa	353 58.8	−42 32.8
42	Antares	113 20.2	−26 20.1
37	Arcturus	146 35.9	+19 25.2
43	Atria	109 01.4	−68 57.1
22	Avior	234 36.8	−59 21.8
13	Bellatrix	279 19.6	+ 6 18.7
16	Betelg'se	271 49.3	+ 7 24.1
17	Canopus	264 16.2	−52 40.0
12	Capella	281 40.0	+45 57.2
53	Deneb	50 01.1	+45 07.1
28	Denebola	183 18.8	+14 49.6
4	Diphda	349 39.9	−18 13.8
27	Dubhe	194 46.0	+61 59.9
14	Elnath	279 08.7	+28 34.3
47	Eltanin	91 06.2	+51 29.8
54	Enif	34 30.1	+ 9 40.1
56	Fomalhaut	16 12.2	−29 51.5
31	Gacrux	172 50.6	−56 51.9
29	Gienah	176 37.9	−17 17.5
35	Hadar	149 50.8	−60 09.7
6	Hamal	328 50.6	+23 15.0
48	Kaus Aust.	84 41.9	−34 24.5
40	Kochab	137 17.6	+74 20.7
57	Markab	14 22.0	+14 57.8
8	Menkar	315 01.3	+ 3 54.9
36	Menkent	148 59.7	−36 09.1
24	Miapl'dus	221 50.3	−69 31.9
9	Mirfak	309 43.8	+49 42.0
50	Nunki	76 52.6	−26 21.3
52	Peacock	54 27.9	−56 52.9
21	Pollux	244 22.0	+28 08.3
20	Procyon	245 46.2	+ 5 20.6
46	R'alhague	96 47.1	+12 35.6
26	Regulus	208 30.7	+12 11.4
11	Rigel	281 54.7	− 8 15.0
38	Rigil Kent.	140 52.2	−60 39.4
44	Sabik	103 02.9	−15 40.3
3	Schedar	350 30.8	+56 17.2
45	Shaula	97 21.5	−37 04.5
18	Sirius	259 12.9	−16 39.0
33	Spica	159 17.9	−10 55.6
23	Suhail	223 25.4	−43 14.9
49	Vega	81 08.5	+38 44.6
39	Zub'g'bi	137 54.3	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 30	31	1	2
N °	h m	h m	h m	h m	h m	h m
72	▭	▭	2 03	4 42	6 48	8 45
70	1 11	////	2 47	5 00	6 56	8 44
68	2 07	////	3 16	5 15	7 02	8 43
66	2 39	////	3 38	5 26	7 07	8 42
64	3 03	////	3 55	5 36	7 11	8 42
62	3 22	////	4 09	5 44	7 15	8 41
60	3 37	////	4 21	5 51	7 18	8 41
58	3 50	////	4 31	5 58	7 21	8 41
56	4 01	////	4 40	6 03	7 23	8 40
54	4 11	////	4 48	6 08	7 25	8 40
52	4 19	1 14	4 55	6 13	7 27	8 40
50	4 27	1 47	5 01	6 16	7 29	8 39
45	4 43	2 35	5 15	6 25	7 33	8 39
40	4 57	3 06	5 26	6 32	7 36	8 38
35	5 08	3 29	5 35	6 38	7 39	8 38
30	5 18	3 47	5 43	6 44	7 42	8 38
20	5 35	4 14	5 57	6 53	7 46	8 37
10	5 49	4 34	6 10	7 01	7 50	8 37
0	6 03	4 50	6 21	7 09	7 53	8 36
10	6 16	5 04	6 33	7 16	7 57	8 36
20	6 31	5 15	6 45	7 24	8 01	8 35
30	6 47	5 24	6 59	7 34	8 05	8 35
35	6 56	5 30	7 07	7 39	8 07	8 35
40	7 06	5 33	7 16	7 45	8 10	8 34
45	7 19	5 38	7 26	7 52	8 13	8 34
50	7 34	5 42	7 39	8 00	8 17	8 34
52	7 41	5 44	7 45	8 04	8 19	8 33
54	7 48	5 45	7 52	8 08	8 21	8 33
56	7 57	5 47	7 59	8 12	8 23	8 33
58	8 07	5 49	8 07	8 17	8 25	8 33
60	8 18	5 51	8 16	8 23	8 28	8 33
S						

Lat.	Sunset	Twlt. ends	Moonset 30	31	1	2
N °	h m	h m	h m	h m	h m	h m
72	▭	▭	21 37	21 05	20 39	20 15
70	22 52	////	21 16	20 54	20 37	20 20
68	22 01	////	21 00	20 46	20 34	20 23
66	21 30	////	20 46	20 39	20 33	20 26
64	21 07	////	20 35	20 33	20 31	20 29
62	20 49	////	20 26	20 28	20 30	20 31
60	20 34	////	20 18	20 24	20 28	20 33
58	20 21	////	20 10	20 20	20 27	20 35
56	20 11	////	20 04	20 16	20 26	20 36
54	20 01	////	19 58	20 13	20 26	20 38
52	19 52	22 53	19 53	20 10	20 25	20 39
50	19 45	22 22	19 48	20 07	20 24	20 40
45	19 29	21 35	19 38	20 01	20 23	20 43
40	19 15	21 04	19 29	19 57	20 21	20 45
35	19 04	20 42	19 22	19 52	20 20	20 47
30	18 54	20 24	19 15	19 48	20 19	20 48
20	18 38	19 58	19 04	19 42	20 17	20 51
10	18 23	19 38	18 54	19 36	20 16	20 54
0	18 10	19 22	18 44	19 30	20 14	20 56
10	17 57	19 10	18 35	19 25	20 12	20 59
20	17 43	18 59	18 24	19 19	20 11	21 01
30	17 27	18 50	18 13	19 12	20 09	21 04
35	17 18	18 45	18 06	19 08	20 08	21 06
40	17 07	18 41	17 58	19 03	20 06	21 08
45	16 55	18 37	17 49	18 58	20 05	21 10
50	16 40	18 33	17 37	18 52	20 03	21 12
52	16 33	18 31	17 32	18 49	20 02	21 14
54	16 25	18 29	17 26	18 45	20 01	21 15
56	16 17	18 28	17 20	18 42	20 00	21 16
58	16 07	18 27	17 13	18 38	19 59	21 18
60	15 56	18 25	17 04	18 33	19 58	21 20
S						

GMT	Equation of Time (App.—Mean) 30	31	1
h	m s	m s	m s
0	− 6 21.4	− 6 19.3	− 6 16.6
6	− 6 20.9	− 6 18.7	− 6 15.9
12	− 6 20.4	− 6 18.0	− 6 15.0
18	− 6 19.9	− 6 17.4	− 6 14.2
24	− 6 19.3	− 6 16.6	− 6 13.3

GMT of Transit Meridian of Greenwich DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
30	12 33	14 52	21 08	10 35	17 36
31	13 20	14 52	21 04	10 32	17 32
1	14 04	14 52	21 01	10 29	17 28
2	14 46	14 52	20 57	10 26	17 24

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.1	0.1	0.3
30			
	0.1	0.1	0.2
45			
	0.1	0.1	0.2
60			
	0.1	0.1	0.1
75			
	0.1	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	30	31	1
°	′	′	′
0	15.7	14.9	14.0
4	15.7	14.9	14.0
8	15.7	14.9	14.0
12	15.7	14.9	14.1
16	15.7	14.9	14.1
20	15.7	15.0	14.1
24	15.7	15.0	14.1
28	15.7	15.0	14.2
32	15.7	15.0	14.2
36	15.7	15.0	14.3
40	15.7	15.0	14.3
44	15.6	15.1	14.4
48	15.6	15.1	14.5
52	15.6	15.1	14.5
56	15.6	15.1	14.6
60	15.6	15.2	14.7
64	15.6	15.2	14.7
68	15.6	15.2	14.8
72	15.6	15.3	14.9
76	15.6	15.3	15.0
80	15.6	15.3	15.1
84	15.6	15.4	15.1
88	15.6	15.4	15.2
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	30	31	1
°	′	′	′
0	15.5	15.9	16.4
4	15.5	15.9	16.4
8	15.5	15.9	16.4
12	15.5	15.9	16.4
16	15.5	15.9	16.4
20	15.5	15.9	16.3
24	15.5	15.9	16.3
28	15.5	15.8	16.3
32	15.5	15.8	16.2
36	15.5	15.8	16.2
40	15.5	15.8	16.1
44	15.5	15.8	16.1
48	15.5	15.7	16.0
52	15.5	15.7	15.9
56	15.5	15.7	15.9
60	15.5	15.6	15.8
64	15.5	15.6	15.7
68	15.5	15.6	15.6
72	15.6	15.6	15.6
76	15.6	15.5	15.5
80	15.6	15.5	15.4
84	15.6	15.4	15.3
88	15.6	15.4	15.2
90			

Subtract from table, back cover

G M T	♈ GHA	VENUS −3.7 GHA	Dec.	MARS −1.6 GHA	Dec.	JUPITER −1.4 GHA	Dec.	SATURN 0.9 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
2 0	310 03.2	136 58.3	+ 3 32.0	44 57.2	−28 15.4	203 08.5	+22 33.4	98 14.6	−10 20.8	144 45.5	153	+ 1 18.6	−133
1	325 05.7	151 58.3	30.7	59 59.6	15.4	218 10.4	33.3	113 17.0	20.8	159 19.8	152	1 05.3	−133
2	340 08.2	166 58.2	29.5	75 01.9	15.4	233 12.3	33.3	128 19.3	20.9	173 54.0	153	0 52.0	−132
3	355 10.6	181 58.2	·· 28.2	90 04.2	·· 15.3	248 14.2	·· 33.2	143 21.7	·· 20.9	188 28.3	153	· 0 38.8	−133
4	10 13.1	196 58.2	27.0	105 06.5	15.3	263 16.0	33.1	158 24.1	20.9	203 02.6	153	0 25.5	−133
5	25 15.5	211 58.1	25.7	120 08.9	15.2	278 17.9	33.1	173 26.4	21.0	217 36.9	154	+ 0 12.2	−132
6	40 18.0	226 58.1	+ 3 24.5	135 11.2	−28 15.2	293 19.8	+22 33.0	188 28.8	−10 21.0	232 11.3	154	− 0 01.0	−133
7	55 20.5	241 58.1	23.2	150 13.5	15.2	308 21.7	33.0	203 31.2	21.1	246 45.7	154	0 14.3	−132
8	70 22.9	256 58.1	22.0	165 15.8	15.1	323 23.6	32.9	218 33.5	21.1	261 20.1	154	0 27.5	−132
9	85 25.4	271 58.0	·· 20.7	180 18.1	·· 15.1	338 25.4	·· 32.8	233 35.9	·· 21.2	275 54.5	155	· 0 40.7	−132
10	100 27.9	286 58.0	19.5	195 20.4	15.1	353 27.3	32.8	248 38.3	21.2	290 29.0	154	0 53.9	−132
11	115 30.3	301 58.0	18.2	210 22.7	15.0	8 29.2	32.7	263 40.6	21.3	305 03.4	155	1 07.1	−131
12	130 32.8	316 58.0	+ 3 17.0	225 25.0	−28 15.0	23 31.1	+22 32.7	278 43.0	−10 21.3	319 37.9	155	− 1 20.2	−132
13	145 35.3	331 57.9	15.7	240 27.4	15.0	38 33.0	32.6	293 45.4	21.4	334 12.4	156	1 33.4	−131
14	160 37.7	346 57.9	14.5	255 29.7	14.9	53 34.9	32.5	308 47.7	21.4	348 47.0	155	1 46.5	−131
15	175 40.2	1 57.9	·· 13.2	270 32.0	·· 14.9	68 36.7	·· 32.5	323 50.1	·· 21.5	3 21.5	156	· 1 59.6	−131
16	190 42.7	16 57.9	12.0	285 34.3	14.8	83 38.6	32.4	338 52.4	21.5	17 56.1	156	2 12.7	−131
17	205 45.1	31 57.8	10.7	300 36.6	14.8	98 40.5	32.4	353 54.8	21.6	32 30.7	156	2 25.8	−131
18	220 47.6	46 57.8	+ 3 09.4	315 38.9	−28 14.8	113 42.4	+22 32.3	8 57.2	−10 21.6	47 05.3	156	− 2 38.9	−130
19	235 50.0	61 57.8	08.2	330 41.2	14.7	128 44.3	32.3	23 59.5	21.6	61 39.9	156	2 51.9	−130
20	250 52.5	76 57.8	06.9	345 43.5	14.7	143 46.2	32.2	39 01.9	21.7	76 14.5	156	3 04.9	−130
21	265 55.0	91 57.7	·· 05.7	0 45.8	·· 14.7	158 48.0	·· 32.1	54 04.3	·· 21.7	90 49.1	157	· 3 17.9	−129
22	280 57.4	106 57.7	04.4	15 48.0	14.6	173 49.9	32.1	69 06.6	21.8	105 23.8	156	3 30.8	−130
23	295 59.9	121 57.7	03.2	30 50.3	14.6	188 51.8	32.0	84 09.0	21.8	119 58.4	157	3 43.8	−129
3 0	311 02.4	136 57.7	+ 3 01.9	45 52.6	−28 14.5	203 53.7	+22 32.0	99 11.4	−10 21.9	134 33.1	156	− 3 56.7	−129
1	326 04.8	151 57.7	3 00.7	60 54.9	14.5	218 55.6	31.9	114 13.7	21.9	149 07.7	157	4 09.6	−128
2	341 07.3	166 57.6	2 59.4	75 57.2	14.5	233 57.5	31.8	129 16.1	22.0	163 42.4	157	4 22.4	−129
3	356 09.8	181 57.6	·· 58.2	90 59.5	·· 14.4	248 59.3	·· 31.8	144 18.4	·· 22.0	178 17.1	157	· 4 35.3	−128
4	11 12.2	196 57.6	56.9	106 01.8	14.4	264 01.2	31.7	159 20.8	22.1	192 51.8	157	4 48.1	−128
5	26 14.7	211 57.6	55.7	121 04.0	14.4	279 03.1	31.7	174 23.2	22.1	207 26.5	156	5 00.9	−127
6	41 17.1	226 57.6	+ 2 54.4	136 06.3	−28 14.3	294 05.0	+22 31.6	189 25.5	−10 22.2	222 01.1	157	− 5 13.6	−127
7	56 19.6	241 57.5	53.2	151 08.6	14.3	309 06.9	31.5	204 27.9	22.2	236 35.8	157	5 26.3	−127
8	71 22.1	256 57.5	51.9	166 10.9	14.2	324 08.8	31.5	219 30.3	22.3	251 10.5	157	5 39.0	−127
9	86 24.5	271 57.5	·· 50.6	181 13.2	·· 14.2	339 10.7	·· 31.4	234 32.6	·· 22.3	265 45.2	157	· 5 51.7	−126
10	101 27.0	286 57.5	49.4	196 15.4	14.2	354 12.5	31.4	249 35.0	22.4	280 19.9	157	6 04.3	−126
11	116 29.5	301 57.5	48.1	211 17.7	14.1	9 14.4	31.3	264 37.3	22.4	294 54.6	157	6 16.9	−125
12	131 31.9	316 57.5	+ 2 46.9	226 20.0	−28 14.1	24 16.3	+22 31.2	279 39.7	−10 22.4	309 29.3	157	− 6 29.4	−126
13	146 34.4	331 57.4	45.6	241 22.2	14.1	39 18.2	31.2	294 42.1	22.5	324 04.0	157	6 42.0	−125
14	161 36.9	346 57.4	44.4	256 24.5	14.0	54 20.1	31.1	309 44.4	22.5	338 38.7	156	6 54.5	−124
15	176 39.3	1 57.4	·· 43.1	271 26.8	·· 14.0	69 22.0	·· 31.1	324 46.8	·· 22.6	353 13.3	157	· 7 06.9	−124
16	191 41.8	16 57.4	41.9	286 29.0	13.9	84 23.8	31.0	339 49.1	22.6	7 48.0	157	7 19.3	−124
17	206 44.3	31 57.4	40.6	301 31.3	13.9	99 25.7	31.0	354 51.5	22.7	22 22.7	156	7 31.7	−124
18	221 46.7	46 57.4	+ 2 39.4	316 33.6	−28 13.9	114 27.6	+22 30.9	9 53.9	−10 22.7	36 57.3	157	− 7 44.1	−123
19	236 49.2	61 57.4	38.1	331 35.8	13.8	129 29.5	30.8	24 56.2	22.8	51 32.0	156	7 56.4	−122
20	251 51.6	76 57.3	36.8	346 38.1	13.8	144 31.4	30.8	39 58.6	22.8	66 06.6	156	8 08.6	−122
21	266 54.1	91 57.3	·· 35.6	1 40.3	·· 13.7	159 33.3	·· 30.7	55 01.0	·· 22.9	80 41.2	156	· 8 20.8	−122
22	281 56.6	106 57.3	34.3	16 42.6	13.7	174 35.2	30.7	70 03.3	22.9	95 15.8	156	8 33.0	−122
23	296 59.0	121 57.3	33.1	31 44.8	13.7	189 37.0	30.6	85 05.7	23.0	109 50.4	156	8 45.2	−121
4 0	312 01.5	136 57.3	+ 2 31.8	46 47.1	−28 13.6	204 38.9	+22 30.5	100 08.0	−10 23.0	124 25.0	156	− 8 57.3	−120
1	327 04.0	151 57.3	30.6	61 49.3	13.6	219 40.8	30.5	115 10.4	23.1	138 59.6	156	9 09.3	−121
2	342 06.4	166 57.3	29.3	76 51.6	13.6	234 42.7	30.4	130 12.7	23.1	153 34.2	155	9 21.4	−119
3	357 08.9	181 57.3	·· 28.0	91 53.8	·· 13.5	249 44.6	·· 30.4	145 15.1	·· 23.2	168 08.7	155	· 9 33.3	−120
4	12 11.4	196 57.3	26.8	106 56.1	13.5	264 46.5	30.3	160 17.5	23.2	182 43.2	155	9 45.3	−119
5	27 13.8	211 57.3	25.5	121 58.3	13.4	279 48.4	30.2	175 19.8	23.3	197 17.7	155	9 57.2	−118
6	42 16.3	226 57.2	+ 2 24.3	137 00.5	−28 13.4	294 50.2	+22 30.2	190 22.2	−10 23.3	211 52.2	155	−10 09.0	−118
7	57 18.8	241 57.2	23.0	152 02.8	13.4	309 52.1	30.1	205 24.5	23.4	226 26.7	154	10 20.8	−118
8	72 21.2	256 57.2	21.8	167 05.0	13.3	324 54.0	30.1	220 26.9	23.4	241 01.1	154	10 32.6	−117
9	87 23.7	271 57.2	·· 20.5	182 07.3	·· 13.3	339 55.9	·· 30.0	235 29.3	·· 23.5	255 35.5	155	·10 44.3	−116
10	102 26.1	286 57.2	19.3	197 09.5	13.2	354 57.8	29.9	250 31.6	23.5	270 10.0	153	10 55.9	−116
11	117 28.6	301 57.2	18.0	212 11.7	13.2	9 59.7	29.9	265 34.0	23.6	284 44.3	154	11 07.5	−116
12	132 31.1	316 57.2	+ 2 16.7	227 14.0	−28 13.2	25 01.6	+22 29.8	280 36.3	−10 23.6	299 18.7	153	−11 19.1	−115
13	147 33.5	331 57.2	15.5	242 16.2	13.1	40 03.5	29.8	295 38.7	23.7	313 53.0	153	11 30.6	−114
14	162 36.0	346 57.2	14.2	257 18.4	13.1	55 05.3	29.7	310 41.1	23.7	328 27.3	153	11 42.0	−114
15	177 38.5	1 57.2	·· 13.0	272 20.6	·· 13.0	70 07.2	·· 29.6	325 43.4	·· 23.8	343 01.6	153	·11 53.4	−114
16	192 40.9	16 57.2	11.7	287 22.9	13.0	85 09.1	29.6	340 45.8	23.8	357 35.9	152	12 04.8	−113
17	207 43.4	31 57.2	10.5	302 25.1	13.0	100 11.0	29.5	355 48.1	23.8	12 10.1	152	12 16.1	−112
18	222 45.9	46 57.2	+ 2 09.2	317 27.3	−28 12.9	115 12.9	+22 29.5	10 50.5	−10 23.9	26 44.3	152	−12 27.3	−112
19	237 48.3	61 57.2	07.9	332 29.5	12.9	130 14.8	29.4	25 52.8	23.9	41 18.5	151	12 38.5	−112
20	252 50.8	76 57.2	06.7	347 31.7	12.8	145 16.7	29.3	40 55.2	24.0	55 52.6	151	12 49.7	−111
21	267 53.2	91 57.1	·· 05.4	2 34.0	·· 12.8	160 18.6	·· 29.3	55 57.5	·· 24.0	70 26.7	151	·13 00.8	−110
22	282 55.7	106 57.1	04.2	17 36.2	12.8	175 20.4	29.2	70 59.9	24.1	85 00.8	150	13 11.8	−110
23	297 58.2	121 57.1	02.9	32 38.4	12.7	190 22.3	29.2	86 02.3	24.1	99 34.8	150	13 22.8	−109
24	313 00.6	136 57.1	+ 2 01.6	47 40.6	−28 12.7	205 24.2	+22 29.1	101 04.6	−10 24.2	114 08.8	150	−13 33.7	−108
code	—	− 1	− 13	+ 22	0	+ 19	0	+ 24	− 1				

GMT		SUN GHA	SUN Dec.
d	h	° ′	° ′
2	0	178 26.7	+17 57.9
	1	193 26.7	57.3
	2	208 26.8	56.7
	3	223 26.8 ••	56.1
	4	238 26.8	55.4
	5	253 26.9	54.8
	6	268 26.9	+17 54.1
	7	283 27.0	53.5
	8	298 27.0	52.9
	9	313 27.0 ••	52.2
	10	328 27.1	51.6
	11	343 27.1	51.0
	12	358 27.2	+17 50.3
	13	13 27.2	49.7
	14	28 27.2	49.0
	15	43 27.3 ••	48.4
	16	58 27.3	47.8
	17	73 27.4	47.1
	18	88 27.4	+17 46.5
	19	103 27.5	45.8
	20	118 27.5	45.2
	21	133 27.5 ••	44.6
	22	148 27.6	43.9
	23	163 27.6	43.3
3	0	178 27.7	+17 42.6
	1	193 27.7	42.0
	2	208 27.8	41.3
	3	223 27.8 ••	40.7
	4	238 27.9	40.0
	5	253 27.9	39.4
	6	268 28.0	+17 38.8
	7	283 28.0	38.1
	8	298 28.0	37.5
	9	313 28.1 ••	36.8
	10	328 28.1	36.2
	11	343 28.2	35.5
	12	358 28.2	+17 34.9
	13	13 28.3	34.2
	14	28 28.3	33.6
	15	43 28.4 ••	32.9
	16	58 28.4	32.3
	17	73 28.5	31.6
	18	88 28.5	+17 30.9
	19	103 28.6	30.3
	20	118 28.6	29.6
	21	133 28.7 ••	29.0
	22	148 28.7	28.3
	23	163 28.8	27.7
4	0	178 28.8	+17 27.0
	1	193 28.9	26.4
	2	208 28.9	25.7
	3	223 29.0 ••	25.1
	4	238 29.0	24.4
	5	253 29.1	23.7
	6	268 29.1	+17 23.1
	7	283 29.2	22.4
	8	298 29.2	21.8
	9	313 29.3 ••	21.1
	10	328 29.3	20.4
	11	343 29.4	19.8
	12	358 29.4	+17 19.1
	13	13 29.5	18.4
	14	28 29.6	17.8
	15	43 29.6 ••	17.1
	16	58 29.7	16.5
	17	73 29.7	15.8
	18	88 29.8	+17 15.1
	19	103 29.8	14.5
	20	118 29.9	13.8
	21	133 29.9 ••	13.1
	22	148 30.0	12.5
	23	163 30.1	11.8
	24	178 30.1	+17 11.1
code		—	−7

STARS No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.7	−40 28.8
5	Achernar	335 59.2	−57 27.6
30	Acrux	173 59.2	−62 51.2
19	Adhara	255 47.5	−28 54.4
10	Aldebaran	291 40.2	+16 25.3
32	Alioth	166 59.4	+56 12.5
34	Alkaid	153 33.6	+49 32.5
55	Al Na'ir	28 38.5	−47 10.7
15	Alnilam	276 31.4	− 1 13.6
25	Alphard	218 39.7	− 8 27.6
41	Alphecca	126 48.2	+26 52.1
1	Alpheratz	358 29.0	+28 50.5
51	Altair	62 50.9	+ 8 44.9
2	Ankaa	353 58.8	−42 32.8
42	Antares	113 20.2	−26 20.1
37	Arcturus	146 35.9	+19 25.2
43	Atria	109 01.4	−68 57.1
22	Avior	234 36.8	−59 21.7
13	Bellatrix	279 19.5	+ 6 18.7
16	Betelg'se	271 49.3	+ 7 24.1
17	Canopus	264 16.2	−52 40.0
12	Capella	281 40.0	+45 57.2
53	Deneb	50 01.1	+45 07.1
28	Denebola	183 18.8	+14 49.6
4	Diphda	349 39.9	−18 13.8
27	Dubhe	194 46.1	+61 59.9
14	Elnath	279 08.6	+28 34.3
47	Eltanin	91 06.2	+51 29.8
54	Enif	34 30.1	+ 9 40.1
56	Fomalhaut	16 12.2	−29 51.5
31	Gacrux	172 50.6	−56 51.8
29	Gienah	176 37.9	−17 17.5
35	Hadar	149 50.8	−60 09.7
6	Hamal	328 50.6	+23 15.0
48	Kaus Aust.	84 41.9	−34 24.5
40	Kochab	137 17.6	+74 20.7
57	Markab	14 22.0	+14 57.8
8	Menkar	315 01.2	+ 3 54.9
36	Menkent	148 59.7	−36 09.1
24	Miapl'dus	221 50.3	−69 31.9
9	Mirfak	309 43.7	+49 42.0
50	Nunki	76 52.6	−26 21.3
52	Peacock	54 27.9	−56 52.9
21	Pollux	244 21.9	+28 08.3
20	Procyon	245 46.2	+ 5 20.6
46	R'alhague	96 47.1	+12 35.6
26	Regulus	208 30.7	+12 11.4
11	Rigel	281 54.6	− 8 15.0
38	Rigil Kent.	140 52.2	−60 39.4
44	Sabik	103 02.9	−15 40.3
3	Schedar	350 30.7	+56 17.3
45	Shaula	97 21.5	−37 04.5
18	Sirius	259 12.9	−16 39.0
33	Spica	159 17.9	−10 55.6
23	Suhail	223 25.4	−43 14.9
49	Vega	81 08.5	+38 44.6
39	Zub'g'bi	137 54.3	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 2	Moonrise 3	Moonrise 4	Moonrise 5
N °	h m	h m	h m	h m	h m	h m
72	□	□	8 45	10 39	12 40	15 06
70	1 39	////	8 44	10 30	12 19	14 20
68	2 22	////	8 43	10 22	12 03	13 50
66	2 51	////	8 42	10 16	11 50	13 28
64	3 13	////	8 42	10 11	11 40	13 10
62	3 30	////	8 41	10 06	11 30	12 56
60	3 44	////	8 41	10 02	11 23	12 44
58	3 56	////	8 41	9 59	11 16	12 34
56	4 06	////	8 40	9 56	11 10	12 25
54	4 16	0 36	8 40	9 53	11 05	12 17
52	4 24	1 28	8 40	9 50	11 00	12 10
50	4 31	1 56	8 39	9 48	10 56	12 03
45	4 47	2 41	8 39	9 43	10 46	11 50
40	4 59	3 11	8 38	9 39	10 39	11 39
35	5 10	3 33	8 38	9 35	10 32	11 29
30	5 20	3 50	8 38	9 32	10 26	11 21
20	5 36	4 16	8 37	9 27	10 16	11 06
10	5 50	4 36	8 37	9 22	10 08	10 54
0	6 03	4 51	8 36	9 18	10 00	10 43
10	6 16	5 03	8 36	9 14	9 52	10 31
20	6 29	5 14	8 35	9 09	9 43	10 19
30	6 44	5 23	8 35	9 04	9 34	10 05
35	6 53	5 27	8 35	9 01	9 28	9 57
40	7 03	5 31	8 34	8 58	9 22	9 48
45	7 15	5 35	8 34	8 54	9 15	9 37
50	7 29	5 39	8 34	8 49	9 06	9 25
52	7 36	5 39	8 33	8 47	9 02	9 19
54	7 43	5 41	8 33	8 45	8 58	9 12
56	7 51	5 42	8 33	8 43	8 53	9 05
58	8 01	5 44	8 33	8 40	8 48	8 57
60	8 11	5 45	8 33	8 37	8 42	8 48
S						

Lat.	Sunset	Twlt. ends	Moonset 2	Moonset 3	Moonset 4	Moonset 5
N °	h m	h m	h m	h m	h m	h m
72	□	□	20 15	19 50	19 18	18 22
70	22 27	////	20 20	20 02	19 41	19 10
68	21 46	////	20 23	20 11	19 58	19 41
66	21 18	////	20 26	20 20	20 12	20 04
64	20 57	////	20 29	20 26	20 24	20 22
62	20 41	////	20 31	20 32	20 34	20 37
60	20 27	////	20 33	20 38	20 43	20 50
58	20 15	////	20 35	20 42	20 51	21 01
56	20 05	////	20 36	20 46	20 57	21 11
54	19 55	23 24	20 38	20 50	21 03	21 19
52	19 47	22 38	20 39	20 53	21 09	21 27
50	19 40	22 12	20 40	20 56	21 14	21 34
45	19 25	21 29	20 43	21 03	21 25	21 49
40	19 12	20 59	20 45	21 09	21 34	22 01
35	19 01	20 38	20 47	21 13	21 41	22 12
30	18 52	20 21	20 48	21 18	21 48	22 21
20	18 36	19 55	20 51	21 25	22 00	22 37
10	18 22	19 36	20 54	21 32	22 10	22 51
0	18 10	19 22	20 56	21 38	22 20	23 04
10	17 57	19 10	20 59	21 44	22 30	23 17
20	17 44	19 00	21 01	21 51	22 41	23 31
30	17 29	18 51	21 04	21 58	22 53	23 47
35	17 20	18 47	21 06	22 03	23 00	23 57
40	17 10	18 43	21 08	22 08	23 08	24 07
45	16 58	18 39	21 10	22 14	23 17	24 20
50	16 44	18 36	21 12	22 21	23 28	24 36
52	16 37	18 34	21 14	22 24	23 33	24 43
54	16 30	18 33	21 15	22 27	23 39	24 51
56	16 22	18 32	21 16	22 31	23 46	25 00
58	16 13	18 31	21 18	22 36	23 53	25 11
60	16 02	18 30	21 20	22 41	24 01	0 01
S						

GMT	Equation of Time (App.—Mean) 2	3	4
h	m s	m s	m s
0	− 6 13.3	− 6 09.4	− 6 04.8
6	− 6 12.4	− 6 08.3	− 6 03.6
12	− 6 11.4	− 6 07.2	− 6 02.3
18	− 6 10.4	− 6 06.0	− 6 01.0
24	− 6 09.4	− 6 04.8	− 5 59.7

GMT of Transit Meridian of Greenwich DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
2	14 46	14 52	20 57	10 26	17 24
3	15 28	14 52	20 53	10 23	17 21
4	16 10	14 52	20 50	10 20	17 17
5	16 53	14 52	20 46	10 17	17 13

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.1	0.1	0.3
30			
	0.1	0.1	0.2
45			
	0.1	0.1	0.2
60			
	0.1	0.1	0.1
75			
	0.1	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	2	3	4
°	′	′	′
0			
	13.4	12.8	12.4
4			
	13.4	12.8	12.4
8			
	13.4	12.8	12.4
12			
	13.4	12.8	12.4
16			
	13.5	12.9	12.5
20			
	13.5	12.9	12.6
24			
	13.6	13.0	12.6
28			
	13.6	13.0	12.7
32			
	13.7	13.1	12.8
36			
	13.7	13.2	12.9
40			
	13.8	13.3	13.0
44			
	13.9	13.4	13.1
48			
	14.0	13.5	13.3
52			
	14.1	13.7	13.4
56			
	14.2	13.8	13.5
60			
	14.3	13.9	13.7
64			
	14.4	14.1	13.9
68			
	14.5	14.2	14.0
72			
	14.6	14.3	14.2
76			
	14.7	14.5	14.4
80			
	14.9	14.6	14.5
84			
	15.0	14.8	14.7
88			
	15.1	14.9	14.8
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	2	3	4
°	′	′	′
0			
	16.8	17.2	17.4
4			
	16.8	17.1	17.4
8			
	16.8	17.1	17.3
12			
	16.7	17.1	17.3
16			
	16.7	17.0	17.2
20			
	16.7	17.0	17.2
24			
	16.6	16.9	17.1
28			
	16.6	16.9	17.0
32			
	16.5	16.8	16.9
36			
	16.4	16.7	16.8
40			
	16.4	16.6	16.7
44			
	16.3	16.5	16.6
48			
	16.2	16.4	16.5
52			
	16.1	16.2	16.3
56			
	16.0	16.1	16.2
60			
	15.9	16.0	16.0
64			
	15.8	15.8	15.9
68			
	15.7	15.7	15.7
72			
	15.6	15.6	15.6
76			
	15.4	15.4	15.4
80			
	15.3	15.3	15.2
84			
	15.2	15.1	15.0
88			
	15.1	15.0	14.9
90			

Subtract from table, back cover

992941°—53——9

GMT	♈ GHA	VENUS −3.7 GHA	VENUS Dec.	MARS −1.6 GHA	MARS Dec.	JUPITER −1.4 GHA	JUPITER Dec.	SATURN 0.9 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
5 0	313 00.6	136 57.1	+2 01.6	47 40.6	−28 12.7	205 24.2	+22 29.1	101 04.6	−10 24.2	114 08.8	150	−13 33.7	−108
1	328 03.1	151 57.1	2 00.4	62 42.8	12.6	220 26.1	29.0	116 07.0	24.2	128 42.8	150	13 44.5	−109
2	343 05.6	166 57.1	1 59.1	77 45.0	12.6	235 28.0	29.0	131 09.3	24.3	143 16.8	149	13 55.4	−107
3	358 08.0	181 57.1	•• 57.9	92 47.2	•• 12.6	250 29.9	•• 28.9	146 11.7	•• 24.3	157 50.7	148	•14 06.1	−107
4	13 10.5	196 57.1	56.6	107 49.4	12.5	265 31.8	28.8	161 14.0	24.4	172 24.5	149	14 16.8	−106
5	28 13.0	211 57.1	55.4	122 51.6	12.5	280 33.7	28.8	176 16.4	24.4	186 58.4	148	14 27.4	−106
6	43 15.4	226 57.1	+1 54.1	137 53.8	−28 12.4	295 35.5	+22 28.7	191 18.8	−10 24.5	201 32.2	147	−14 38.0	−105
7	58 17.9	241 57.1	52.8	152 56.0	12.4	310 37.4	28.7	206 21.1	24.5	216 05.9	148	14 48.5	−104
8	73 20.4	256 57.1	51.6	167 58.2	12.4	325 39.3	28.6	221 23.5	24.6	230 39.7	146	14 58.9	−104
9	88 22.8	271 57.1	•• 50.3	183 00.4	•• 12.3	340 41.2	•• 28.5	236 25.8	•• 24.6	245 13.3	147	•15 09.3	−103
10	103 25.3	286 57.1	49.1	198 02.6	12.3	355 43.1	28.5	251 28.2	24.7	259 47.0	146	15 19.6	−102
11	118 27.7	301 57.1	47.8	213 04.8	12.2	10 45.0	28.4	266 30.5	24.7	274 20.6	146	15 29.8	−102
12	133 30.2	316 57.1	+1 46.6	228 07.0	−28 12.2	25 46.9	+22 28.4	281 32.9	−10 24.8	288 54.2	145	−15 40.0	−101
13	148 32.7	331 57.1	45.3	243 09.2	12.2	40 48.8	28.3	296 35.2	24.8	303 27.7	144	15 50.1	−101
14	163 35.1	346 57.1	44.0	258 11.4	12.1	55 50.7	28.2	311 37.6	24.9	318 01.1	145	16 00.2	−100
15	178 37.6	1 57.1	•• 42.8	273 13.6	•• 12.1	70 52.5	•• 28.2	326 39.9	•• 24.9	332 34.6	144	•16 10.2	−99
16	193 40.1	16 57.2	41.5	288 15.7	12.0	85 54.4	28.1	341 42.3	25.0	347 08.0	143	16 20.1	−98
17	208 42.5	31 57.2	40.3	303 17.9	12.0	100 56.3	28.1	356 44.6	25.0	1 41.3	143	16 29.9	−98
18	223 45.0	46 57.2	+1 39.0	318 20.1	−28 12.0	115 58.2	+22 28.0	11 47.0	−10 25.1	16 14.6	143	−16 39.7	−97
19	238 47.5	61 57.2	37.7	333 22.3	11.9	131 00.1	27.9	26 49.4	25.1	30 47.9	142	16 49.4	−97
20	253 49.9	76 57.2	36.5	348 24.5	11.9	146 02.0	27.9	41 51.7	25.2	45 21.1	141	16 59.1	−95
21	268 52.4	91 57.2	•• 35.2	3 26.6	•• 11.8	161 03.9	•• 27.8	56 54.1	•• 25.2	59 54.2	141	•17 08.6	−95
22	283 54.8	106 57.2	34.0	18 28.8	11.8	176 05.8	27.8	71 56.4	25.3	74 27.3	141	17 18.1	−95
23	298 57.3	121 57.2	32.7	33 31.0	11.7	191 07.7	27.7	86 58.8	25.3	89 00.4	140	17 27.6	−93
6 0	313 59.8	136 57.2	+1 31.4	48 33.2	−28 11.7	206 09.6	+22 27.6	102 01.1	−10 25.4	103 33.4	140	−17 36.9	−93
1	329 02.2	151 57.2	30.2	63 35.3	11.7	221 11.4	27.6	117 03.5	25.4	118 06.4	139	17 46.2	−92
2	344 04.7	166 57.2	28.9	78 37.5	11.6	236 13.3	27.5	132 05.8	25.5	132 39.3	139	17 55.4	−91
3	359 07.2	181 57.2	•• 27.7	93 39.7	•• 11.6	251 15.2	•• 27.5	147 08.2	•• 25.5	147 12.2	138	•18 04.5	−91
4	14 09.6	196 57.2	26.4	108 41.8	11.5	266 17.1	27.4	162 10.5	25.6	161 45.0	138	18 13.6	−90
5	29 12.1	211 57.2	25.1	123 44.0	11.5	281 19.0	27.3	177 12.9	25.6	176 17.8	137	18 22.6	−89
6	44 14.6	226 57.2	+1 23.9	138 46.2	−28 11.5	296 20.9	+22 27.3	192 15.2	−10 25.7	190 50.5	136	−18 31.5	−88
7	59 17.0	241 57.2	22.6	153 48.3	11.4	311 22.8	27.2	207 17.6	25.7	205 23.1	136	18 40.3	−88
8	74 19.5	256 57.3	21.4	168 50.5	11.4	326 24.7	27.1	222 19.9	25.8	219 55.7	136	18 49.1	−86
9	89 22.0	271 57.3	•• 20.1	183 52.7	•• 11.3	341 26.6	•• 27.1	237 22.3	•• 25.8	234 28.3	135	•18 57.7	−86
10	104 24.4	286 57.3	18.8	198 54.8	11.3	356 28.5	27.0	252 24.6	25.9	249 00.8	135	19 06.3	−85
11	119 26.9	301 57.3	17.6	213 57.0	11.2	11 30.4	27.0	267 27.0	26.0	263 33.3	134	19 14.8	−85
12	134 29.3	316 57.3	+1 16.3	228 59.1	−28 11.2	26 32.2	+22 26.9	282 29.3	−10 26.0	278 05.7	133	−19 23.3	−83
13	149 31.8	331 57.3	15.1	244 01.3	11.2	41 34.1	26.8	297 31.7	26.1	292 38.0	133	19 31.6	−83
14	164 34.3	346 57.3	13.8	259 03.4	11.1	56 36.0	26.8	312 34.0	26.1	307 10.3	132	19 39.9	−81
15	179 36.7	1 57.3	•• 12.5	274 05.6	•• 11.1	71 37.9	•• 26.7	327 36.4	•• 26.2	321 42.5	132	•19 48.0	−81
16	194 39.2	16 57.3	11.3	289 07.7	11.0	86 39.8	26.7	342 38.7	26.2	336 14.7	131	19 56.1	−80
17	209 41.7	31 57.4	10.0	304 09.9	11.0	101 41.7	26.6	357 41.1	26.3	350 46.8	131	20 04.1	−80
18	224 44.1	46 57.4	+1 08.8	319 12.0	−28 10.9	116 43.6	+22 26.5	12 43.4	−10 26.3	5 18.9	130	−20 12.1	−78
19	239 46.6	61 57.4	07.5	334 14.1	10.9	131 45.5	26.5	27 45.8	26.4	19 50.9	129	20 19.9	−78
20	254 49.1	76 57.4	06.2	349 16.3	10.9	146 47.4	26.4	42 48.1	26.4	34 22.8	129	20 27.7	−76
21	269 51.5	91 57.4	•• 05.0	4 18.4	•• 10.8	161 49.3	•• 26.4	57 50.5	•• 26.5	48 54.7	129	•20 35.3	−76
22	284 54.0	106 57.4	03.7	19 20.6	10.8	176 51.2	26.3	72 52.8	26.5	63 26.6	128	20 42.9	−75
23	299 56.5	121 57.4	02.5	34 22.7	10.7	191 53.1	26.2	87 55.2	26.6	77 58.4	127	20 50.4	−74
7 0	314 58.9	136 57.5	+1 01.2	49 24.8	−28 10.7	206 54.9	+22 26.2	102 57.5	−10 26.6	92 30.1	127	−20 57.8	−73
1	330 01.4	151 57.5	0 59.9	64 27.0	10.6	221 56.8	26.1	117 59.9	26.7	107 01.8	126	21 05.1	−72
2	345 03.8	166 57.5	58.7	79 29.1	10.6	236 58.7	26.0	133 02.2	26.7	121 33.4	125	21 12.3	−72
3	0 06.3	181 57.5	•• 57.4	94 31.2	•• 10.6	252 00.6	•• 26.0	148 04.6	•• 26.8	136 04.9	125	•21 19.5	−70
4	15 08.8	196 57.5	56.2	109 33.4	10.5	267 02.5	25.9	163 06.9	26.8	150 36.4	124	21 26.5	−69
5	30 11.2	211 57.5	54.9	124 35.5	10.5	282 04.4	25.9	178 09.3	26.9	165 07.8	124	21 33.4	−69
6	45 13.7	226 57.6	+0 53.6	139 37.6	−28 10.4	297 06.3	+22 25.8	193 11.6	−10 26.9	179 39.2	123	−21 40.3	−67
7	60 16.2	241 57.6	52.4	154 39.7	10.4	312 08.2	25.7	208 14.0	27.0	194 10.5	123	21 47.0	−67
8	75 18.6	256 57.6	51.1	169 41.9	10.3	327 10.1	25.7	223 16.3	27.0	208 41.8	122	21 53.7	−66
9	90 21.1	271 57.6	•• 49.9	184 44.0	•• 10.3	342 12.0	•• 25.6	238 18.7	•• 27.1	223 13.0	121	•22 00.3	−64
10	105 23.6	286 57.6	48.6	199 46.1	10.3	357 13.9	25.5	253 21.0	27.1	237 44.1	121	22 06.7	−64
11	120 26.0	301 57.6	47.3	214 48.2	10.2	12 15.8	25.5	268 23.4	27.2	252 15.2	120	22 13.1	−63
12	135 28.5	316 57.7	+0 46.1	229 50.3	−28 10.2	27 17.7	+22 25.4	283 25.7	−10 27.2	266 46.2	120	−22 19.4	−61
13	150 30.9	331 57.7	44.8	244 52.4	10.1	42 19.6	25.4	298 28.1	27.3	281 17.2	119	22 25.5	−61
14	165 33.4	346 57.7	43.6	259 54.6	10.1	57 21.5	25.3	313 30.4	27.3	295 48.1	118	22 31.6	−60
15	180 35.9	1 57.7	•• 42.3	274 56.7	•• 10.0	72 23.3	•• 25.2	328 32.8	•• 27.4	310 18.9	118	•22 37.6	−58
16	195 38.3	16 57.7	41.0	289 58.8	10.0	87 25.2	25.2	343 35.1	27.5	324 49.7	117	22 43.4	−58
17	210 40.8	31 57.8	39.8	305 00.9	10.0	102 27.1	25.1	358 37.4	27.5	339 20.4	117	22 49.2	−57
18	225 43.3	46 57.8	+0 38.5	320 03.0	−28 09.9	117 29.0	+22 25.1	13 39.8	−10 27.6	353 51.1	116	−22 54.9	−55
19	240 45.7	61 57.8	37.2	335 05.1	09.9	132 30.9	25.0	28 42.1	27.6	8 21.7	116	23 00.4	−55
20	255 48.2	76 57.8	36.0	350 07.2	09.8	147 32.8	24.9	43 44.5	27.7	22 52.3	115	23 05.9	−54
21	270 50.7	91 57.9	•• 34.7	5 09.3	•• 09.8	162 34.7	•• 24.9	58 46.8	•• 27.7	37 22.8	114	•23 11.3	−52
22	285 53.1	106 57.9	33.5	20 11.4	09.7	177 36.6	24.8	73 49.2	27.8	51 53.2	114	23 16.5	−52
23	300 55.6	121 57.9	32.2	35 13.5	09.7	192 38.5	24.7	88 51.5	27.8	66 23.6	113	23 21.7	−50
24	315 58.1	136 57.9	+0 30.9	50 15.6	−28 09.6	207 40.4	+22 24.7	103 53.9	−10 27.9	80 53.9	113	−23 26.7	−49
code	—	0	−12	+22	0	+19	−1	+24	−1				

GMT h	SUN GHA ° ′	Dec. ° ′
5 0	178 30.1	+17 11.1
1	193 30.2	10.5
2	208 30.2	09.8
3	223 30.3 ••	09.1
4	238 30.3	08.5
5	253 30.4	07.8
6	268 30.5	+17 07.1
7	283 30.5	06.4
8	298 30.6	05.8
9	313 30.6 ••	05.1
10	328 30.7	04.4
11	343 30.8	03.8
12	358 30.8	+17 03.1
13	13 30.9	02.4
14	28 30.9	01.7
15	43 31.0 ••	01.1
16	58 31.1	17 00.4
17	73 31.1	16 59.7
18	88 31.2	+16 59.0
19	103 31.2	58.4
20	118 31.3	57.7
21	133 31.4 ••	57.0
22	148 31.4	56.3
23	163 31.5	55.6
6 0	178 31.6	+16 55.0
1	193 31.6	54.3
2	208 31.7	53.6
3	223 31.8 ••	52.9
4	238 31.8	52.2
5	253 31.9	51.6
6	268 32.0	+16 50.9
7	283 32.0	50.2
8	298 32.1	49.5
9	313 32.1 ••	48.8
10	328 32.2	48.1
11	343 32.3	47.5
12	358 32.3	+16 46.8
13	13 32.4	46.1
14	28 32.5	45.4
15	43 32.5 ••	44.7
16	58 32.6	44.0
17	73 32.7	43.3
18	88 32.8	+16 42.7
19	103 32.8	42.0
20	118 32.9	41.3
21	133 33.0 ••	40.6
22	148 33.0	39.9
23	163 33.1	39.2
7 0	178 33.2	+16 38.5
1	193 33.2	37.8
2	208 33.3	37.1
3	223 33.4 ••	36.4
4	238 33.4	35.8
5	253 33.5	35.1
6	268 33.6	+16 34.4
7	283 33.7	33.7
8	298 33.7	33.0
9	313 33.8 ••	32.3
10	328 33.9	31.6
11	343 34.0	30.9
12	358 34.0	+16 30.2
13	13 34.1	29.5
14	28 34.2	28.8
15	43 34.2 ••	28.1
16	58 34.3	27.4
17	73 34.4	26.7
18	88 34.5	+16 26.0
19	103 34.5	25.3
20	118 34.6	24.6
21	133 34.7 ••	23.9
22	148 34.8	23.2
23	163 34.8	22.5
24	178 34.9	+16 21.8
code	—	− 7

STARS No.	Name	SHA ° ′	Dec. ° ′
7	Acamar	315 51.7	−40 28.8
5	Achernar	335 59.2	−57 27.6
30	Acrux	173 59.3	−62 51.2
19	Adhara	255 47.5	−28 54.4
10	Aldebaran	291 40.2	+16 25.3
32	Alioth	166 59.4	+56 12.5
34	Alkaid	153 33.6	+49 32.5
55	Al Na'ir	28 38.5	−47 10.7
15	Alnilam	276 31.3	− 1 13.6
25	Alphard	218 39.7	− 8 27.6
41	Alphecca	126 48.2	+26 52.1
1	Alpheratz	358 29.0	+28 50.5
51	Altair	62 50.9	+ 8 45.0
2	Ankaa	353 58.8	−42 32.8
42	Antares	113 20.2	−26 20.1
37	Arcturus	146 36.0	+19 25.2
43	Atria	109 01.4	−68 57.1
22	Avior	234 36.8	−59 21.7
13	Bellatrix	279 19.5	+ 6 18.7
16	Betelg'se	271 49.3	+ 7 24.1
17	Canopus	264 16.2	−52 40.0
12	Capella	281 39.9	+45 57.2
53	Deneb	50 01.1	+45 07.2
28	Denebola	183 18.8	+14 49.6
4	Diphda	349 39.9	−18 13.8
27	Dubhe	194 46.1	+61 59.9
14	Elnath	279 08.6	+28 34.3
47	Eltanin	91 06.2	+51 29.8
54	Enif	34 30.1	+ 9 40.1
56	Fomalhaut	16 12.2	−29 51.5
31	Gacrux	172 50.6	−56 51.8
29	Gienah	176 37.9	−17 17.5
35	Hadar	149 50.8	−60 09.6
6	Hamal	328 50.5	+23 15.0
48	Kaus Aust.	84 41.9	−34 24.5
40	Kochab	137 17.7	+74 20.7
57	Markab	14 22.0	+14 57.8
8	Menkar	315 01.2	+ 3 54.9
36	Menkent	148 59.8	−36 09.1
24	Miapl'dus	221 50.3	−69 31.9
9	Mirfak	309 43.7	+49 42.0
50	Nunki	76 52.6	−26 21.3
52	Peacock	54 27.9	−56 52.9
21	Pollux	244 21.9	+28 08.3
20	Procyon	245 46.2	+ 5 20.6
46	R'alhague	96 47.2	+12 35.6
26	Regulus	208 30.7	+12 11.4
11	Rigel	281 54.6	− 8 15.0
38	Rigil Kent.	140 52.2	−60 39.4
44	Sabik	103 02.9	−15 40.3
3	Schedar	350 30.7	+56 17.3
45	Shaula	97 21.5	−37 04.5
18	Sirius	259 12.9	−16 39.0
33	Spica	159 17.9	−10 55.6
23	Suhail	223 25.4	−43 14.9
49	Vega	81 08.5	+38 44.6
39	Zub'g'bi	137 54.3	−15 51.4

Lat. °	Sunrise h m	Twlt. begins h m	Moonrise 5 h m	Moonrise 6 h m	Moonrise 7 h m	Moonrise 8 h m
N 72	0 48	////	15 06	■	■	■
70	2 01	////	14 20	■	■	■
68	2 37	////	13 50	15 52	■	■
66	3 02	////	13 28	15 12	17 10	■
64	3 22	////	13 10	14 44	16 21	17 56
62	3 38	////	12 56	14 23	15 49	17 11
60	3 51	////	12 44	14 06	15 26	16 41
58	4 02	////	12 34	13 51	15 08	16 18
56	4 12	////	12 25	13 39	14 52	16 00
54	4 21	1 03	12 17	13 28	14 39	15 45
52	4 29	1 41	12 10	13 19	14 27	15 31
50	4 36	2 06	12 03	13 11	14 17	15 20
45	4 50	2 47	11 50	12 53	13 55	14 55
40	5 02	3 14	11 39	12 38	13 38	14 36
35	5 13	3 36	11 29	12 26	13 23	14 20
30	5 22	3 53	11 21	12 16	13 11	14 06
20	5 37	4 18	11 06	11 58	12 50	13 42
10	5 50	4 36	10 54	11 42	12 31	13 22
0	6 02	4 51	10 43	11 27	12 14	13 03
10	6 15	5 03	10 31	11 12	11 57	12 44
20	6 28	5 12	10 19	10 57	11 38	12 24
30	6 42	5 21	10 05	10 39	11 17	12 00
35	6 50	5 24	9 57	10 29	11 05	11 47
40	7 00	5 28	9 48	10 17	10 51	11 31
45	7 11	5 31	9 37	10 04	10 35	11 12
50	7 24	5 34	9 25	9 47	10 14	10 49
52	7 31	5 35	9 19	9 39	10 05	10 38
54	7 38	5 36	9 12	9 30	9 54	10 25
56	7 45	5 37	9 05	9 21	9 42	10 11
58	7 54	5 39	8 57	9 10	9 27	9 54
S 60	8 04	5 39	8 48	8 57	9 11	9 33

Lat. °	Sunset h m	Twlt. ends h m	Moonset 5 h m	Moonset 6 h m	Moonset 7 h m	Moonset 8 h m
N 72	23 08	////	18 22	■	■	■
70	22 06	////	19 10	■	■	■
68	21 31	////	19 41	19 12	■	■
66	21 06	////	20 04	19 53	19 33	■
64	20 47	////	20 22	20 21	20 23	20 31
62	20 32	////	20 37	20 43	20 54	21 16
60	20 19	////	20 50	21 01	21 18	21 46
58	20 08	////	21 01	21 16	21 37	22 09
56	19 58	////	21 11	21 29	21 53	22 27
54	19 50	23 01	21 19	21 40	22 07	22 43
52	19 42	22 26	21 27	21 50	22 18	22 56
50	19 35	22 02	21 34	21 58	22 29	23 08
45	19 21	21 22	21 49	22 17	22 51	23 33
40	19 09	20 55	22 01	22 32	23 09	23 52
35	18 59	20 35	22 12	22 45	23 24	24 09
30	18 50	20 18	22 21	22 57	23 37	24 23
20	18 35	19 54	22 37	23 16	24 00	0 00
10	18 21	19 35	22 51	23 33	24 19	0 19
0	18 09	19 21	23 04	23 49	24 37	0 37
10	17 57	19 09	23 17	24 05	0 05	0 55
20	17 45	19 00	23 31	24 22	0 22	1 15
30	17 30	18 52	23 47	24 42	0 42	1 38
35	17 22	18 49	23 57	24 54	0 54	1 51
40	17 13	18 46	24 07	0 07	1 07	2 06
45	17 02	18 43	24 20	0 20	1 23	2 24
50	16 48	18 39	24 36	0 36	1 43	2 47
52	16 42	18 39	24 43	0 43	1 52	2 58
54	16 35	18 37	24 51	0 51	2 02	3 11
56	16 28	18 37	25 00	1 00	2 14	3 25
58	16 19	18 36	25 11	1 11	2 28	3 42
S 60	16 09	18 35	0 01	1 23	2 44	4 02

Equation of Time (App.—Mean)

GMT h	5 m s	6 m s	7 m s
0	− 5 59.7	− 5 53.9	− 5 47.5
6	− 5 58.3	− 5 52.3	− 5 45.8
12	− 5 56.8	− 5 50.8	− 5 44.0
18	− 5 55.4	− 5 49.1	− 5 42.3
24	− 5 53.9	− 5 47.5	− 5 40.5

GMT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
5	16 53	14 52	20 46	10 17	17 13
6	17 38	14 52	20 43	10 14	17 09
7	18 25	14 52	20 39	10 11	17 06
8	19 15	14 52	20 36	10 08	17 02

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0			
	0.1	0.2	0.3
30			
	0.1	0.1	0.2
45			
	0.1	0.1	0.2
60			
	0.1	0.1	0.1
75			
	0.1	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt. °	5 ′	6 ′	7 ′
0			
	12.1	12.1	12.2
4			
	12.1	12.1	12.3
8			
	12.2	12.2	12.3
12			
	12.2	12.2	12.3
16			
	12.2	12.2	12.4
20			
	12.3	12.3	12.4
24			
	12.4	12.4	12.5
28			
	12.5	12.5	12.6
32			
	12.6	12.6	12.7
36			
	12.7	12.7	12.8
40			
	12.8	12.8	12.9
44			
	12.9	12.9	13.0
48			
	13.1	13.1	13.2
52			
	13.2	13.2	13.3
56			
	13.4	13.4	13.5
60			
	13.5	13.5	13.6
64			
	13.7	13.7	13.8
68			
	13.9	13.9	14.0
72			
	14.1	14.1	14.1
76			
	14.3	14.3	14.3
80			
	14.4	14.4	14.5
84			
	14.6	14.6	14.7
88			
	14.8	14.8	14.8
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt. °	5 ′	6 ′	7 ′
0			
	17.5	17.5	17.4
4			
	17.5	17.5	17.4
8			
	17.5	17.5	17.4
12			
	17.4	17.4	17.4
16			
	17.4	17.4	17.3
20			
	17.3	17.3	17.3
24			
	17.2	17.2	17.2
28			
	17.2	17.2	17.1
32			
	17.1	17.1	17.0
36			
	16.9	16.9	16.9
40			
	16.8	16.8	16.8
44			
	16.7	16.7	16.6
48			
	16.6	16.6	16.5
52			
	16.4	16.4	16.4
56			
	16.2	16.2	16.2
60			
	16.1	16.1	16.1
64			
	15.9	15.9	15.9
68			
	15.7	15.7	15.7
72			
	15.6	15.6	15.6
76			
	15.4	15.4	15.4
80			
	15.2	15.2	15.2
84			
	15.0	15.0	15.0
88			
	14.9	14.9	14.9
90			

Subtract from table, back cover

First Quarter 6

GMT	♈ GHA	VENUS −3.7 GHA	VENUS Dec.	MARS −1.5 GHA	MARS Dec.	JUPITER −1.4 GHA	JUPITER Dec.	SATURN 0.9 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
8 0	315 58.1	136 57.9	+ 0 30.9	50 15.6	−28 09.6	207 40.4	+22 24.7	103 53.9	−10 27.9	80 53.9	113	−23 26.7	− 49
1	331 00.5	151 58.0	29.7	65 17.7	09.6	222 42.3	24.6	118 56.2	27.9	95 24.2	112	23 31.6	− 48
2	346 03.0	166 58.0	28.4	80 19.8	09.6	237 44.2	24.6	133 58.6	28.0	109 54.4	111	23 36.4	− 48
3	1 05.4	181 58.0	•• 27.2	95 21.9	•• 09.5	252 46.1	•• 24.5	149 00.9	•• 28.0	124 24.5	111	·23 41.2	− 46
4	16 07.9	196 58.0	25.9	110 24.0	09.5	267 48.0	24.4	164 03.2	28.1	138 54.6	110	23 45.8	− 45
5	31 10.4	211 58.1	24.6	125 26.1	09.4	282 49.9	24.4	179 05.6	28.1	153 24.6	110	23 50.3	− 43
6	46 12.8	226 58.1	+ 0 23.4	140 28.1	−28 09.4	297 51.8	+22 24.3	194 07.9	−10 28.2	167 54.6	109	−23 54.6	− 43
7	61 15.3	241 58.1	22.1	155 30.2	09.3	312 53.7	24.2	209 10.3	28.2	182 24.5	109	23 58.9	− 42
8	76 17.8	256 58.1	20.8	170 32.3	09.3	327 55.6	24.2	224 12.6	28.3	196 54.4	108	24 03.1	− 40
9	91 20.2	271 58.2	•• 19.6	185 34.4	•• 09.2	342 57.5	•• 24.1	239 15.0	•• 28.4	211 24.2	108	·24 07.1	− 40
10	106 22.7	286 58.2	18.3	200 36.5	09.2	357 59.3	24.1	254 17.3	28.4	225 54.0	107	24 11.1	− 38
11	121 25.2	301 58.2	17.1	215 38.6	09.2	13 01.2	24.0	269 19.7	28.5	240 23.7	106	24 14.9	− 37
12	136 27.6	316 58.2	+ 0 15.8	230 40.6	−28 09.1	28 03.1	+22 23.9	284 22.0	−10 28.5	254 53.3	106	−24 18.6	− 36
13	151 30.1	331 58.3	14.5	245 42.7	09.1	43 05.0	23.9	299 24.3	28.6	269 22.9	106	24 22.2	− 35
14	166 32.6	346 58.3	13.3	260 44.8	09.0	58 06.9	23.8	314 26.7	28.6	283 52.5	105	24 25.7	− 33
15	181 35.0	1 58.3	•• 12.0	275 46.9	•• 09.0	73 08.8	•• 23.8	329 29.0	•• 28.7	298 22.0	104	·24 29.0	− 33
16	196 37.5	16 58.4	10.8	290 48.9	08.9	88 10.7	23.7	344 31.4	28.7	312 51.4	104	24 32.3	− 31
17	211 39.9	31 58.4	09.5	305 51.0	08.9	103 12.6	23.6	359 33.7	28.8	327 20.8	104	24 35.4	− 30
18	226 42.4	46 58.4	+ 0 08.2	320 53.1	−28 08.8	118 14.5	+22 23.6	14 36.1	−10 28.8	341 50.2	102	−24 38.4	− 29
19	241 44.9	61 58.4	07.0	335 55.1	08.8	133 16.4	23.5	29 38.4	28.9	356 19.4	103	24 41.3	− 27
20	256 47.3	76 58.5	05.7	350 57.2	08.8	148 18.3	23.4	44 40.7	28.9	10 48.7	102	24 44.0	− 27
21	271 49.8	91 58.5	•• 04.5	5 59.3	•• 08.7	163 20.2	•• 23.4	59 43.1	•• 29.0	25 17.9	101	·24 46.7	− 25
22	286 52.3	106 58.5	03.2	21 01.3	08.7	178 22.1	23.3	74 45.4	29.1	39 47.0	101	24 49.2	− 24
23	301 54.7	121 58.6	01.9	36 03.4	08.6	193 24.0	23.3	89 47.8	29.1	54 16.1	101	24 51.6	− 23
9 0	316 57.2	136 58.6	+ 0 00.7	51 05.5	−28 08.6	208 25.9	+22 23.2	104 50.1	−10 29.2	68 45.2	100	−24 53.9	− 22
1	331 59.7	151 58.6	− 0 00.6	66 07.5	08.5	223 27.8	23.1	119 52.5	29.2	83 14.2	99	24 56.1	− 20
2	347 02.1	166 58.7	01.9	81 09.6	08.5	238 29.7	23.1	134 54.8	29.3	97 43.1	99	24 58.1	− 19
3	2 04.6	181 58.7	•• 03.1	96 11.6	•• 08.4	253 31.6	•• 23.0	149 57.1	•• 29.3	112 12.0	99	·25 00.0	− 18
4	17 07.1	196 58.7	04.4	111 13.7	08.4	268 33.5	22.9	164 59.5	29.4	126 40.9	98	25 01.8	− 17
5	32 09.5	211 58.8	05.6	126 15.7	08.3	283 35.4	22.9	180 01.8	29.4	141 09.7	98	25 03.5	− 15
6	47 12.0	226 58.8	− 0 06.9	141 17.8	−28 08.3	298 37.3	+22 22.8	195 04.2	−10 29.5	155 38.5	98	−25 05.0	− 14
7	62 14.4	241 58.8	08.2	156 19.8	08.3	313 39.2	22.8	210 06.5	29.5	170 07.3	97	25 06.4	− 13
8	77 16.9	256 58.9	09.4	171 21.9	08.2	328 41.1	22.7	225 08.8	29.6	184 36.0	96	25 07.7	− 12
9	92 19.4	271 58.9	•• 10.7	186 23.9	•• 08.2	343 43.0	•• 22.6	240 11.2	•• 29.6	199 04.6	96	·25 08.9	− 10
10	107 21.8	286 58.9	11.9	201 26.0	08.1	358 44.9	22.6	255 13.5	29.7	213 33.2	96	25 09.9	− 9
11	122 24.3	301 59.0	13.2	216 28.0	08.1	13 46.8	22.5	270 15.9	29.8	228 01.8	96	25 10.8	− 8
12	137 26.8	316 59.0	− 0 14.5	231 30.1	−28 08.0	28 48.7	+22 22.4	285 18.2	−10 29.8	242 30.4	95	−25 11.6	− 7
13	152 29.2	331 59.1	15.7	246 32.1	08.0	43 50.6	22.4	300 20.6	29.9	256 58.9	95	25 12.3	− 5
14	167 31.7	346 59.1	17.0	261 34.1	07.9	58 52.5	22.3	315 22.9	29.9	271 27.4	94	25 12.8	− 4
15	182 34.2	1 59.1	•• 18.3	276 36.2	•• 07.9	73 54.4	•• 22.2	330 25.2	•• 30.0	285 55.8	94	·25 13.2	− 2
16	197 36.6	16 59.2	19.5	291 38.2	07.8	88 56.3	22.2	345 27.6	30.0	300 24.2	94	25 13.4	− 2
17	212 39.1	31 59.2	20.8	306 40.3	07.8	103 58.2	22.1	0 29.9	30.1	314 52.6	93	25 13.6	0
18	227 41.6	46 59.2	− 0 22.0	321 42.3	−23 07.7	119 00.1	+22 22.1	15 32.3	−10 30.1	329 20.9	93	−25 13.6	+ 1
19	242 44.0	61 59.3	23.3	336 44.3	07.7	134 02.0	22.0	30 34.6	30.2	343 49.2	93	25 13.5	+ 3
20	257 46.5	76 59.3	24.6	351 46.3	07.7	149 03.9	21.9	45 36.9	30.2	358 17.5	92	25 13.2	+ 4
21	272 48.9	91 59.4	•• 25.8	6 48.4	•• 07.6	164 05.8	•• 21.9	60 39.3	•• 30.3	12 45.7	92	·25 12.8	+ 5
22	287 51.4	106 59.4	27.1	21 50.4	07.6	179 07.7	21.8	75 41.6	30.4	27 13.9	92	25 12.3	+ 7
23	302 53.9	121 59.4	28.3	36 52.4	07.5	194 09.6	21.7	90 43.9	30.4	41 42.1	92	25 11.6	+ 7
10 0	317 56.3	136 59.5	− 0 29.6	51 54.5	−28 07.5	209 11.5	+22 21.7	105 46.3	−10 30.5	56 10.3	91	−25 10.9	+ 10
1	332 58.8	151 59.5	30.9	66 56.5	07.4	224 13.4	21.6	120 48.6	30.5	70 38.4	92	25 09.9	+ 10
2	348 01.3	166 59.6	32.1	81 58.5	07.4	239 15.3	21.6	135 51.0	30.6	85 06.6	90	25 08.9	+ 12
3	3 03.7	181 59.6	•• 33.4	97 00.5	•• 07.3	254 17.2	•• 21.5	150 53.3	•• 30.6	99 34.6	91	·25 07.7	+ 13
4	18 06.2	196 59.6	34.6	112 02.5	07.3	269 19.1	21.4	165 55.6	30.7	114 02.7	91	25 06.4	+ 14
5	33 08.7	211 59.7	35.9	127 04.5	07.2	284 21.0	21.4	180 58.0	30.7	128 30.8	90	25 05.0	+ 16
6	48 11.1	226 59.7	− 0 37.2	142 06.6	−28 07.2	299 22.9	+22 21.3	196 00.3	−10 30.8	142 58.8	90	−25 03.4	+ 17
7	63 13.6	241 59.8	38.4	157 08.6	07.1	314 24.8	21.2	211 02.7	30.9	157 26.8	90	25 01.7	+ 19
8	78 16.0	256 59.8	39.7	172 10.6	07.1	329 26.7	21.2	226 05.0	30.9	171 54.8	89	24 59.8	+ 20
9	93 18.5	271 59.9	•• 41.0	187 12.6	•• 07.0	344 28.6	•• 21.1	241 07.3	•• 31.0	186 22.7	90	·24 57.8	+ 21
10	108 21.0	286 59.9	42.2	202 14.6	07.0	359 30.5	21.1	256 09.7	31.0	200 50.7	89	24 55.7	+ 23
11	123 23.4	301 59.9	43.5	217 16.6	06.9	14 32.4	21.0	271 12.0	31.1	215 18.6	89	24 53.4	+ 23
12	138 25.9	317 00.0	− 0 44.7	232 18.6	−28 06.9	29 34.3	+22 20.9	286 14.3	−10 31.1	229 46.5	90	−24 51.1	+ 26
13	153 28.4	332 00.0	46.0	247 20.6	06.9	44 36.2	20.9	301 16.7	31.2	244 14.5	88	24 48.5	+ 26
14	168 30.8	347 00.1	47.3	262 22.6	06.8	59 38.1	20.8	316 19.0	31.2	258 42.3	89	24 45.9	+ 28
15	183 33.3	2 00.1	•• 48.5	277 24.6	•• 06.8	74 40.0	•• 20.7	331 21.3	•• 31.3	273 10.2	89	·24 43.1	+ 30
16	198 35.8	17 00.2	49.8	292 26.6	06.7	89 41.9	20.7	346 23.7	31.4	287 38.1	89	24 40.1	+ 30
17	213 38.2	32 00.2	51.0	307 28.6	06.7	104 43.8	20.6	1 26.0	31.4	302 06.0	88	24 37.1	+ 32
18	228 40.7	47 00.3	− 0 52.3	322 30.6	−28 06.6	119 45.7	+22 20.5	16 28.4	−10 31.5	316 33.8	89	−24 33.9	+ 33
19	243 43.2	62 00.3	53.6	337 32.6	06.6	134 47.6	20.5	31 30.7	31.5	331 01.7	88	24 30.6	+ 35
20	258 45.6	77 00.4	54.8	352 34.6	06.5	149 49.5	20.4	46 33.0	31.6	345 29.5	89	24 27.1	+ 36
21	273 48.1	92 00.4	•• 56.1	7 36.6	•• 06.5	164 51.4	•• 20.4	61 35.4	•• 31.6	359 57.4	88	·24 23.5	+ 38
22	288 50.5	107 00.4	57.3	22 38.6	06.4	179 53.3	20.3	76 37.7	31.7	14 25.2	88	24 19.7	+ 38
23	303 53.0	122 00.5	58.6	37 40.6	06.4	194 55.2	20.2	91 40.0	31.7	28 53.0	88	24 15.9	+ 40
24	318 55.5	137 00.5	− 0 59.9	52 42.6	−28 06.3	209 57.1	+22 20.2	106 42.4	−10 31.8	43 20.8	89	−24 11.9	+ 42
code	—	+ 1	− 12	+ 20	0	+ 19	0	+ 24	− 1				

GMT	SUN GHA	Dec.
h	° ′	° ′
8 0	178 34.9	+16 21.8
1	193 35.0	21.1
2	208 35.1	20.4
3	223 35.2	•• 19.7
4	238 35.2	19.0
5	253 35.3	18.3
6	268 35.4	+16 17.6
7	283 35.5	16.9
8	298 35.5	16.2
9	313 35.6	•• 15.5
10	328 35.7	14.8
11	343 35.8	14.1
12	358 35.9	+16 13.4
13	13 35.9	12.7
14	28 36.0	12.0
15	43 36.1	•• 11.2
16	58 36.2	10.5
17	73 36.3	09.8
18	88 36.3	+16 09.1
19	103 36.4	08.4
20	118 36.5	07.7
21	133 36.6	•• 07.0
22	148 36.7	06.3
23	163 36.7	05.6
9 0	178 36.8	+16 04.8
1	193 36.9	04.1
2	208 37.0	03.4
3	223 37.1	•• 02.7
4	238 37.2	02.0
5	253 37.2	01.3
6	268 37.3	+16 00.6
7	283 37.4	15 59.9
8	298 37.5	59.1
9	313 37.6	•• 58.4
10	328 37.7	57.7
11	343 37.8	57.0
12	358 37.8	+15 56.3
13	13 37.9	55.6
14	28 38.0	54.8
15	43 38.1	•• 54.1
16	58 38.2	53.4
17	73 38.3	52.7
18	88 38.4	+15 52.0
19	103 38.4	51.2
20	118 38.5	50.5
21	133 38.6	•• 49.8
22	148 38.7	49.1
23	163 38.8	48.3
10 0	178 38.9	+15 47.6
1	193 39.0	46.9
2	208 39.1	46.2
3	223 39.2	•• 45.5
4	238 39.2	44.7
5	253 39.3	44.0
6	268 39.4	+15 43.3
7	283 39.5	42.6
8	298 39.6	41.8
9	313 39.7	•• 41.1
10	328 39.8	40.4
11	343 39.9	39.6
12	358 40.0	+15 38.9
13	13 40.1	38.2
14	28 40.2	37.5
15	43 40.2	•• 36.7
16	58 40.3	36.0
17	73 40.4	35.3
18	88 40.5	+15 34.5
19	103 40.6	33.8
20	118 40.7	33.1
21	133 40.8	•• 32.3
22	148 40.9	31.6
23	163 41.0	30.9
24	178 41.1	+15 30.1
code	—	— 7

No.	Name	STARS SHA	Dec.
		° ′	° ′
7	Acamar	315 51.7	−40 28.7
5	Achernar	335 59.2	−57 27.6
30	Acrux	173 59.3	−62 51.2
19	Adhara	255 47.5	−28 54.4
10	Aldebaran	291 40.1	+16 25.3
32	Alioth	166 59.5	+56 12.5
34	Alkaid	153 33.6	+49 32.5
55	Al Na'ir	28 38.5	−47 10.7
15	Alnilam	276 31.3	− 1 13.6
25	Alphard	218 39.7	− 8 27.6
41	Alphecca	126 48.2	+26 52.1
1	Alpheratz	358 29.0	+28 50.5
51	Altair	62 50.9	+ 8 45.0
2	Ankaa	353 58.8	−42 32.8
42	Antares	113 20.2	−26 20.1
37	Arcturus	146 36.0	+19 25.2
43	Atria	109 01.5	−68 57.2
22	Avior	234 36.8	−59 21.7
13	Bellatrix	279 19.5	+ 6 18.7
16	Betelg'se	271 49.3	+ 7 24.1
17	Canopus	264 16.2	−52 40.0
12	Capella	281 39.9	+45 57.2
53	Deneb	50 01.1	+45 07.2
28	Denebola	183 18.8	+14 49.6
4	Diphda	349 39.9	−18 13.8
27	Dubhe	194 46.1	+61 59.9
14	Elnath	279 08.6	+28 34.3
47	Eltanin	91 06.3	+51 29.8
54	Enif	34 30.1	+ 9 40.1
56	Fomalhaut	16 12.2	−29 51.5
31	Gacrux	172 50.6	−56 51.8
29	Gienah	176 38.0	−17 17.5
35	Hadar	149 50.8	−60 09.6
6	Hamal	328 50.5	+23 15.0
48	Kaus Aust.	84 42.0	−34 24.5
40	Kochab	137 17.7	+74 20.7
57	Markab	14 22.0	+14 57.8
8	Menkar	315 01.2	+ 3 55.0
36	Menkent	148 59.8	−36 09.1
24	Miapl'dus	221 50.3	−69 31.8
9	Mirfak	309 43.7	+49 42.0
50	Nunki	76 52.6	−26 21.3
52	Peacock	54 27.9	−56 52.9
21	Pollux	244 21.9	+28 08.3
20	Procyon	245 46.1	+ 5 20.6
46	R'alhague	96 47.2	+12 35.6
26	Regulus	208 30.7	+12 11.4
11	Rigel	281 54.6	− 8 15.0
38	Rigil Kent.	140 52.3	−60 39.4
44	Sabik	103 02.9	−15 40.3
3	Schedar	350 30.7	+56 17.3
45	Shaula	97 21.5	−37 04.5
18	Sirius	259 12.9	−16 39.0
33	Spica	159 17.9	−10 55.6
23	Suhail	223 25.4	−43 14.9
49	Vega	81 08.5	+38 44.6
39	Zub'g'bi	137 54.3	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 8	9	10	11
N °	h m	h m	h m	h m	h m	h m
72	1 29	////	■	■	■	■
70	2 20	////	■	■	■	■
68	2 51	////	■	■	■	■
66	3 14	////	■	■	■	20 23
64	3 31	////	17 56	19 09	19 36	19 42
62	3 46	////	17 11	18 15	18 54	19 14
60	3 58	////	16 41	17 42	18 25	18 52
58	4 09	////	16 18	17 18	18 03	18 34
56	4 18	////	16 00	16 59	17 45	18 19
54	4 26	1 21	15 45	16 43	17 30	18 06
52	4 33	1 53	15 31	16 29	17 17	17 55
50	4 40	2 14	15 20	16 17	17 05	17 45
45	4 54	2 53	14 55	15 51	16 41	17 24
40	5 05	3 19	14 36	15 31	16 22	17 06
35	5 15	3 39	14 20	15 14	16 05	16 52
30	5 23	3 55	14 06	15 00	15 51	16 39
20	5 38	4 20	13 42	14 35	15 27	16 17
10	5 50	4 36	13 22	14 14	15 07	15 58
0	6 02	4 50	13 03	13 54	14 47	15 41
10	6 14	5 02	12 44	13 35	14 28	15 23
20	6 26	5 11	12 24	13 14	14 07	15 04
30	6 40	5 19	12 00	12 49	13 43	14 42
35	6 48	5 23	11 47	12 35	13 29	14 29
40	6 57	5 26	11 31	12 18	13 13	14 14
45	7 07	5 29	11 12	11 58	12 53	13 57
50	7 20	5 30	10 49	11 34	12 29	13 35
52	7 26	5 31	10 38	11 22	12 17	13 24
54	7 32	5 32	10 25	11 08	12 04	13 12
56	7 39	5 32	10 11	10 52	11 48	12 59
58	7 47	5 34	9 54	10 33	11 30	12 43
60 S	7 56	5 34	9 33	10 10	11 07	12 23

Lat.	Sunset	Twlt. ends	Moonset 8	9	10	11
N °	h m	h m	h m	h m	h m	h m
72	22 33	////	■	■	■	■
70	21 46	////	■	■	■	■
68	21 17	////	■	■	■	■
66	20 55	////	■	■	■	23 34
64	20 37	////	20 31	21 06	22 29	24 14
62	20 23	////	21 16	22 00	23 11	24 42
60	20 11	////	21 46	22 32	23 40	25 03
58	20 01	////	22 09	22 56	24 01	0 01
56	19 52	23 38	22 27	23 16	24 19	0 19
54	19 44	22 43	22 43	23 32	24 34	0 34
52	19 37	22 14	22 56	23 46	24 47	0 47
50	19 30	21 52	23 08	23 58	24 59	0 59
45	19 16	21 15	23 33	24 23	0 23	1 23
40	19 05	20 49	23 52	24 43	0 43	1 41
35	18 56	20 31	24 09	0 09	1 00	1 57
30	18 47	20 14	24 23	0 23	1 15	2 11
20	18 33	19 51	0 00	0 47	1 39	2 34
10	18 20	19 33	0 19	1 08	2 00	2 54
0	18 09	19 20	0 37	1 28	2 20	3 13
10	17 58	19 10	0 55	1 47	2 39	3 32
20	17 46	19 01	1 15	2 08	3 01	3 52
30	17 32	18 54	1 38	2 32	3 25	4 14
35	17 24	18 50	1 51	2 46	3 39	4 28
40	17 15	18 47	2 06	3 03	3 56	4 43
45	17 05	18 45	2 24	3 22	4 15	5 01
50	16 52	18 43	2 47	3 47	4 40	5 24
52	16 47	18 43	2 58	3 59	4 52	5 35
54	16 40	18 42	3 11	4 13	5 06	5 47
56	16 33	18 41	3 25	4 28	5 21	6 01
58	16 25	18 41	3 42	4 47	5 40	6 17
60 S	16 16	18 41	4 02	5 10	6 03	6 37

GMT	Equation of Time (App.—Mean) 8	9	10
h	m s	m s	m s
0	− 5 40.5	− 5 32.8	− 5 24.6
6	− 5 38.6	− 5 30.8	− 5 22.5
12	− 5 36.7	− 5 28.8	− 5 20.3
18	− 5 34.8	− 5 26.7	− 5 18.1
24	− 5 32.8	− 5 24.6	− 5 15.8

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
8	19 15	14 52	20 36	10 08	17 02
9	20 07	14 52	20 33	10 05	16 58
10	21 00	14 52	20 30	10 02	16 54
11	21 54	14 52	20 27	9 59	16 51

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.1	0.2	0.3
30	0.1	0.1	0.2
45	0.1	0.1	0.2
60	0.1	0.1	0.1
75	0.1	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	8	9	10
°	′	′	′
0			
4	12.6	13.3	14.0
8	12.6	13.3	14.0
12	12.7	13.3	14.0
16	12.7	13.3	14.1
20	12.7	13.3	14.1
24	12.8	13.4	14.1
28	12.9	13.4	14.1
32	12.9	13.5	14.2
36	13.0	13.6	14.2
40	13.1	13.6	14.3
44	13.2	13.7	14.3
48	13.3	13.8	14.4
52	13.4	13.9	14.5
56	13.6	14.0	14.5
60	13.7	14.1	14.6
64	13.8	14.2	14.7
68	14.0	14.3	14.7
72	14.1	14.4	14.8
76	14.3	14.6	14.9
80	14.4	14.7	15.0
84	14.6	14.8	15.1
88	14.8	14.9	15.1
90	14.9	15.0	15.2

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	8	9	10
°	′	′	′
0			
4	17.2	16.9	16.4
8	17.2	16.8	16.4
12	17.2	16.8	16.4
16	17.2	16.8	16.4
20	17.1	16.8	16.4
24	17.1	16.7	16.3
28	17.0	16.7	16.3
32	16.9	16.6	16.3
36	16.8	16.6	16.2
40	16.7	16.5	16.2
44	16.6	16.4	16.1
48	16.5	16.3	16.1
52	16.4	16.2	16.0
56	16.3	16.1	15.9
60	16.1	16.0	15.9
64	16.0	15.9	15.8
68	15.9	15.8	15.7
72	15.7	15.7	15.6
76	15.6	15.6	15.6
80	15.4	15.4	15.5
84	15.2	15.3	15.4
88	15.1	15.2	15.3
90	15.0	15.1	15.2

Subtract from table, back cover

G M T	♈ GHA	VENUS −3.8 GHA	Dec.	MARS −1.4 GHA	Dec.	JUPITER −1.5 GHA	Dec.	SATURN 0.9 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
11 0	318 55.5	137 00.5	− 0 59.9	52 42.6	−28 06.3	209 57.1	+22 20.2	106 42.4	−10 31.8	43 20.8	89	−24 11.9	+ 42
1	333 57.9	152 00.6	1 01.1	67 44.6	06.3	224 59.0	20.1	121 44.7	31.9	57 48.7	88	24 07.7	+ 43
2	349 00.4	167 00.6	02.4	82 46.5	06.2	240 00.9	20.0	136 47.0	31.9	72 16.5	88	24 03.4	+ 44
3	4 02.9	182 00.7	·· 03.7	97 48.5	·· 06.2	255 02.8	·· 20.0	151 49.4	·· 32.0	86 44.3	88	·23 59.0	+ 45
4	19 05.3	197 00.7	04.9	112 50.5	06.1	270 04.7	19.9	166 51.7	32.0	101 12.1	89	23 54.5	+ 47
5	34 07.8	212 00.8	06.2	127 52.5	06.1	285 06.6	19.8	181 54.0	32.1	115 40.0	88	23 49.8	+ 48
6	49 10.3	227 00.8	− 1 07.4	142 54.5	−28 06.0	300 08.5	+22 19.8	196 56.4	−10 32.1	130 07.8	88	−23 45.0	+ 50
7	64 12.7	242 00.9	08.7	157 56.4	06.0	315 10.4	19.7	211 58.7	32.2	144 35.6	89	23 40.0	+ 51
8	79 15.2	257 00.9	10.0	172 58.4	05.9	330 12.3	19.7	227 01.0	32.3	159 03.5	88	23 34.9	+ 52
9	94 17.7	272 01.0	·· 11.2	188 00.4	·· 05.9	345 14.2	·· 19.6	242 03.4	·· 32.3	173 31.3	89	·23 29.7	+ 53
10	109 20.1	287 01.0	12.5	203 02.4	05.8	0 16.1	19.5	257 05.7	32.4	187 59.2	89	23 24.4	+ 55
11	124 22.6	302 01.1	13.7	218 04.3	05.8	15 18.0	19.5	272 08.0	32.4	202 27.1	88	23 18.9	+ 56
12	139 25.0	317 01.2	− 1 15.0	233 06.3	−28 05.7	30 19.9	+22 19.4	287 10.4	−10 32.5	216 54.9	89	−23 13.3	+ 58
13	154 27.5	332 01.2	16.3	248 08.3	05.7	45 21.8	19.3	302 12.7	32.5	231 22.8	89	23 07.5	+ 59
14	169 30.0	347 01.3	17.5	263 10.3	05.6	60 23.7	19.3	317 15.0	32.6	245 50.7	89	23 01.6	+ 60
15	184 32.4	2 01.3	·· 18.8	278 12.2	·· 05.6	75 25.6	·· 19.2	332 17.4	·· 32.7	260 18.6	89	·22 55.6	+ 61
16	199 34.9	17 01.4	20.0	293 14.2	05.5	90 27.5	19.1	347 19.7	32.7	274 46.5	90	22 49.5	+ 63
17	214 37.4	32 01.4	21.3	308 16.1	05.5	105 29.4	19.1	2 22.0	32.8	289 14.5	89	22 43.2	+ 64
18	229 39.8	47 01.5	− 1 22.6	323 18.1	−28 05.4	120 31.3	+22 19.0	17 24.4	−10 32.8	303 42.4	90	−22 36.8	+ 65
19	244 42.3	62 01.5	23.8	338 20.1	05.4	135 33.2	19.0	32 26.7	32.9	318 10.4	90	22 30.3	+ 67
20	259 44.8	77 01.6	25.1	353 22.0	05.3	150 35.1	18.9	47 29.0	32.9	332 38.4	89	22 23.6	+ 68
21	274 47.2	92 01.6	·· 26.3	8 24.0	·· 05.3	165 37.0	·· 18.8	62 31.4	·· 33.0	347 06.3	91	·22 16.8	+ 69
22	289 49.7	107 01.7	27.6	23 25.9	05.3	180 38.9	18.8	77 33.7	33.1	1 34.4	90	22 09.9	+ 70
23	304 52.2	122 01.7	28.9	38 27.9	05.2	195 40.9	18.7	92 36.0	33.1	16 02.4	90	22 02.9	+ 72
12 0	319 54.6	137 01.8	− 1 30.1	53 29.8	−28 05.2	210 42.8	+22 18.6	107 38.4	−10 33.2	30 30.4	91	−21 55.7	+ 73
1	334 57.1	152 01.9	31.4	68 31.8	05.1	225 44.7	18.6	122 40.7	33.2	44 58.5	91	21 48.4	+ 75
2	349 59.5	167 01.9	32.6	83 33.7	05.1	240 46.6	18.5	137 43.0	33.3	59 26.6	91	21 40.9	+ 75
3	5 02.0	182 02.0	·· 33.9	98 35.7	·· 05.0	255 48.5	·· 18.4	152 45.4	·· 33.3	73 54.7	91	·21 33.4	+ 77
4	20 04.5	197 02.0	35.1	113 37.6	05.0	270 50.4	18.4	167 47.7	33.4	88 22.8	91	21 25.7	+ 78
5	35 06.9	212 02.1	36.4	128 39.6	04.9	285 52.3	18.3	182 50.0	33.5	102 50.9	92	21 17.9	+ 80
6	50 09.4	227 02.1	− 1 37.7	143 41.5	−28 04.9	300 54.2	+22 18.2	197 52.4	−10 33.5	117 19.1	92	−21 09.9	+ 80
7	65 11.9	242 02.2	38.9	158 43.5	04.8	315 56.1	18.2	212 54.7	33.6	131 47.3	92	21 01.9	+ 82
8	80 14.3	257 02.3	40.2	173 45.4	04.8	330 58.0	18.1	227 57.0	33.6	146 15.5	93	20 53.7	+ 83
9	95 16.8	272 02.3	·· 41.4	188 47.4	·· 04.7	345 59.9	·· 18.1	242 59.3	·· 33.7	160 43.8	92	·20 45.4	+ 84
10	110 19.3	287 02.4	42.7	203 49.3	04.7	1 01.8	18.0	258 01.7	33.7	175 12.0	93	20 37.0	+ 86
11	125 21.7	302 02.4	44.0	218 51.2	04.6	16 03.7	17.9	273 04.0	33.8	189 40.3	93	20 28.4	+ 86
12	140 24.2	317 02.5	− 1 45.2	233 53.2	−28 04.6	31 05.6	+22 17.9	288 06.3	−10 33.9	204 08.6	94	−20 19.8	+ 88
13	155 26.6	332 02.6	46.5	248 55.1	04.5	46 07.5	17.8	303 08.7	33.9	218 37.0	93	20 11.0	+ 89
14	170 29.1	347 02.6	47.7	263 57.0	04.5	61 09.4	17.7	318 11.0	34.0	233 05.3	94	20 02.1	+ 91
15	185 31.6	2 02.7	·· 49.0	278 59.0	·· 04.4	76 11.3	·· 17.7	333 13.3	·· 34.0	247 33.7	94	·19 53.0	+ 91
16	200 34.0	17 02.7	50.3	294 00.9	04.4	91 13.2	17.6	348 15.7	34.1	262 02.1	95	19 43.9	+ 93
17	215 36.5	32 02.8	51.5	309 02.8	04.3	106 15.1	17.5	3 18.0	34.1	276 30.6	95	19 34.6	+ 93
18	230 39.0	47 02.9	− 1 52.8	324 04.8	−28 04.2	121 17.1	+22 17.5	18 20.3	−10 34.2	290 59.1	95	−19 25.3	+ 95
19	245 41.4	62 02.9	54.0	339 06.7	04.2	136 19.0	17.4	33 22.6	34.3	305 27.6	95	19 15.8	+ 96
20	260 43.9	77 03.0	55.3	354 08.6	04.1	151 20.9	17.3	48 25.0	34.3	319 56.1	96	19 06.2	+ 98
21	275 46.4	92 03.1	·· 56.5	9 10.5	·· 04.1	166 22.8	·· 17.3	63 27.3	·· 34.4	334 24.7	95	·18 56.4	+ 98
22	290 48.8	107 03.1	57.8	24 12.4	04.0	181 24.7	17.2	78 29.6	34.4	348 53.2	97	18 46.6	+ 99
23	305 51.3	122 03.2	1 59.1	39 14.4	04.0	196 26.6	17.2	93 32.0	34.5	3 21.9	96	18 36.7	+101
13 0	320 53.8	137 03.3	− 2 00.3	54 16.3	−28 03.9	211 28.5	+22 17.1	108 34.3	−10 34.6	17 50.5	97	−18 26.6	+102
1	335 56.2	152 03.3	01.6	69 18.2	03.9	226 30.4	17.0	123 36.6	34.6	32 19.2	97	18 16.4	+103
2	350 58.7	167 03.4	02.8	84 20.1	03.8	241 32.3	17.0	138 38.9	34.7	46 47.9	97	18 06.1	+103
3	6 01.1	182 03.4	·· 04.1	99 22.0	·· 03.8	256 34.2	·· 16.9	153 41.3	·· 34.7	61 16.6	98	·17 55.8	+105
4	21 03.6	197 03.5	05.4	114 23.9	03.7	271 36.1	16.8	168 43.6	34.8	75 45.4	98	17 45.3	+106
5	36 06.1	212 03.6	06.6	129 25.9	03.7	286 38.0	16.8	183 45.9	34.8	90 14.2	98	17 34.7	+107
6	51 08.5	227 03.6	− 2 07.9	144 27.8	−28 03.6	301 39.9	+22 16.7	198 48.3	−10 34.9	104 43.0	99	−17 24.0	+109
7	66 11.0	242 03.7	09.1	159 29.7	03.6	316 41.8	16.6	213 50.6	35.0	119 11.9	99	17 13.1	+109
8	81 13.5	257 03.8	10.4	174 31.6	03.5	331 43.8	16.6	228 52.9	35.0	133 40.8	99	17 02.2	+110
9	96 15.9	272 03.8	·· 11.6	189 33.5	·· 03.5	346 45.7	·· 16.5	243 55.2	·· 35.1	148 09.7	99	·16 51.2	+111
10	111 18.4	287 03.9	12.9	204 35.4	03.4	1 47.6	16.4	258 57.6	35.1	162 38.6	100	16 40.1	+112
11	126 20.9	302 04.0	14.2	219 37.3	03.4	16 49.5	16.4	273 59.9	35.2	177 07.6	100	16 28.9	+114
12	141 23.3	317 04.0	− 2 15.4	234 39.2	−28 03.3	31 51.4	+22 16.3	289 02.2	−10 35.3	191 36.6	101	−16 17.5	+114
13	156 25.8	332 04.1	16.7	249 41.1	03.3	46 53.3	16.2	304 04.5	35.3	206 05.7	101	16 06.1	+115
14	171 28.3	347 04.2	17.9	264 43.0	03.2	61 55.2	16.2	319 06.9	35.4	220 34.8	101	15 54.6	+116
15	186 30.7	2 04.2	·· 19.2	279 44.9	·· 03.2	76 57.1	·· 16.1	334 09.2	·· 35.4	235 03.9	101	·15 43.0	+117
16	201 33.2	17 04.3	20.4	294 46.8	03.1	91 59.0	16.1	349 11.5	35.5	249 33.0	101	15 31.3	+118
17	216 35.6	32 04.4	21.7	309 48.7	03.1	107 00.9	16.0	4 13.9	35.6	264 02.1	102	15 19.5	+119
18	231 38.1	47 04.5	− 2 23.0	324 50.6	−28 03.0	122 02.8	+22 15.9	19 16.2	−10 35.6	278 31.3	103	−15 07.6	+120
19	246 40.6	62 04.5	24.2	339 52.5	03.0	137 04.7	15.9	34 18.5	35.7	293 00.6	102	14 55.6	+121
20	261 43.0	77 04.6	25.5	354 54.4	02.9	152 06.7	15.8	49 20.8	35.7	307 29.8	103	14 43.5	+122
21	276 45.5	92 04.7	·· 26.7	9 56.2	·· 02.9	167 08.6	·· 15.7	64 23.2	·· 35.8	321 59.1	103	·14 31.3	+122
22	291 48.0	107 04.7	28.0	24 58.1	02.8	182 10.5	15.7	79 25.5	35.8	336 28.4	103	14 19.1	+124
23	306 50.4	122 04.8	29.2	40 00.0	02.8	197 12.4	15.6	94 27.8	35.9	350 57.7	104	14 06.7	+124
24	321 52.9	137 04.9	− 2 30.5	55 01.9	−28 02.7	212 14.3	+22 15.5	109 30.1	−10 36.0	5 27.1	104	−13 54.3	+126
code	—	+ 1	− 13	+ 19	+ 1	+ 19	− 1	+ 24	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
11 0	178 41.1	+15 30.1
1	193 41.2	29.4
2	208 41.3	28.7
3	223 41.4	·· 27.9
4	238 41.5	27.2
5	253 41.6	26.5
6	268 41.7	+15 25.7
7	283 41.8	25.0
8	298 41.9	24.3
9	313 42.0	·· 23.5
10	328 42.1	22.8
11	343 42.2	22.1
12	358 42.2	+15 21.3
13	13 42.3	20.6
14	28 42.4	19.8
15	43 42.5	·· 19.1
16	58 42.6	18.4
17	73 42.7	17.6
18	88 42.8	+15 16.9
19	103 42.9	16.1
20	118 43.0	15.4
21	133 43.1	·· 14.7
22	148 43.2	13.9
23	163 43.3	13.2
12 0	178 43.4	+15 12.4
1	193 43.5	11.7
2	208 43.6	10.9
3	223 43.7	·· 10.2
4	238 43.9	09.4
5	253 44.0	08.7
6	268 44.1	+15 08.0
7	283 44.2	07.2
8	298 44.3	06.5
9	313 44.4	·· 05.7
10	328 44.5	05.0
11	343 44.6	04.2
12	358 44.7	+15 03.5
13	13 44.8	02.7
14	28 44.9	02.0
15	43 45.0	·· 01.2
16	58 45.1	15 00.5
17	73 45.2	14 59.7
18	88 45.3	+14 59.0
19	103 45.4	58.2
20	118 45.5	57.5
21	133 45.6	·· 56.7
22	148 45.7	56.0
23	163 45.8	55.2
13 0	178 45.9	+14 54.5
1	193 46.0	53.7
2	208 46.2	53.0
3	223 46.3	·· 52.2
4	238 46.4	51.4
5	253 46.5	50.7
6	268 46.6	+14 49.9
7	283 46.7	49.2
8	298 46.8	48.4
9	313 46.9	·· 47.7
10	328 47.0	46.9
11	343 47.1	46.1
12	358 47.2	+14 45.4
13	13 47.3	44.6
14	28 47.5	43.9
15	43 47.6	·· 43.1
16	58 47.7	42.3
17	73 47.8	41.6
18	88 47.9	+14 40.8
19	103 48.0	40.1
20	118 48.1	39.3
21	133 48.2	·· 38.5
22	148 48.3	37.8
23	163 48.5	37.0
24	178 48.6	+14 36.3
code	—	− 8

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.7	−40 28.7
5	Achernar	335 59.1	−57 27.6
30	Acrux	173 59.3	−62 51.2
19	Adhara	255 47.5	−28 54.4
10	Aldebaran	291 40.1	+16 25.3
32	Alioth	166 59.5	+56 12.5
34	Alkaid	153 33.6	+49 32.5
55	Al Na'ir	28 38.4	−47 10.7
15	Alnilam	276 31.3	− 1 13.6
25	Alphard	218 39.7	− 8 27.6
41	Alphecca	126 48.3	+26 52.1
1	Alpheratz	358 28.9	+28 50.5
51	Altair	62 50.9	+ 8 45.0
2	Ankaa	353 58.7	−42 32.8
42	Antares	113 20.3	−26 20.1
37	Arcturus	146 36.0	+19 25.2
43	Atria	109 01.5	−68 57.2
22	Avior	234 36.8	−59 21.7
13	Bellatrix	279 19.5	+ 6 18.7
16	Betelg'se	271 49.2	+ 7 24.1
17	Canopus	264 16.1	−52 39.9
12	Capella	281 39.9	+45 57.2
53	Deneb	50 01.1	+45 07.2
28	Denebola	183 18.8	+14 49.6
4	Diphda	349 39.8	−18 13.8
27	Dubhe	194 46.1	+61 59.9
14	Elnath	279 08.6	+28 34.3
47	Eltanin	91 06.3	+51 29.8
54	Enif	34 30.1	+ 9 40.1
56	Fomalhaut	16 12.1	−29 51.5
31	Gacrux	172 50.6	−56 51.8
29	Gienah	176 38.0	−17 17.5
35	Hadar	149 50.9	−60 09.6
6	Hamal	328 50.5	+23 15.0
48	Kaus Aust.	84 42.0	−34 24.5
40	Kochab	137 17.8	+74 20.7
57	Markab	14 22.0	+14 57.8
8	Menkar	315 01.2	+ 3 55.0
36	Menkent	148 59.8	−36 09.1
24	Miapl'dus	221 50.3	−69 31.8
9	Mirfak	309 43.6	+49 42.0
50	Nunki	76 52.6	−26 21.3
52	Peacock	54 27.9	−56 52.9
21	Pollux	244 21.9	+28 08.3
20	Procyon	245 46.1	+ 5 20.6
46	R'alhague	96 47.2	+12 35.6
26	Regulus	208 30.7	+12 11.4
11	Rigel	281 54.6	− 8 15.0
38	Rigil Kent.	140 52.3	−60 39.4
44	Sabik	103 02.9	−15 40.3
3	Schedar	350 30.6	+56 17.3
45	Shaula	97 21.6	−37 04.5
18	Sirius	259 12.8	−16 39.0
33	Spica	159 17.9	−10 55.6
23	Suhail	223 25.4	−43 14.9
49	Vega	81 08.5	+38 44.6
39	Zub'g'bi	137 54.3	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 11	Moonrise 12	Moonrise 13	Moonrise 14
N °	h m	h m	h m	h m	h m	h m
72	1 57	////	■	■	21 07	20 24
70	2 37	////	■	21 27	20 37	20 10
68	3 04	////	■	20 38	20 14	19 58
66	3 25	////	20 23	20 07	19 57	19 48
64	3 41	////	19 42	19 43	19 42	19 40
62	3 54	////	19 14	19 24	19 30	19 33
60	4 06	////	18 52	19 09	19 19	19 27
58	4 15	////	18 34	18 55	19 10	19 22
56	4 24	0 55	18 19	18 44	19 02	19 17
54	4 31	1 37	18 06	18 34	18 55	19 12
52	4 38	2 04	17 55	18 25	18 49	19 08
50	4 44	2 23	17 45	18 17	18 43	19 05
45	4 57	2 59	17 24	18 00	18 30	18 57
40	5 08	3 23	17 06	17 45	18 20	18 50
35	5 17	3 42	16 52	17 33	18 11	18 45
30	5 25	3 58	16 39	17 23	18 03	18 40
20	5 39	4 21	16 17	17 04	17 49	18 31
10	5 51	4 38	15 58	16 49	17 37	18 23
0	6 02	4 51	15 41	16 34	17 25	18 16
10	6 12	5 01	15 23	16 19	17 14	18 09
20	6 24	5 10	15 04	16 03	17 02	18 01
30	6 37	5 17	14 42	15 44	16 48	17 52
35	6 44	5 19	14 29	15 33	16 39	17 47
40	6 53	5 22	14 14	15 21	16 30	17 41
45	7 03	5 24	13 57	15 06	16 19	17 34
50	7 15	5 26	13 35	14 48	16 06	17 26
52	7 20	5 27	13 24	14 39	16 00	17 22
54	7 26	5 27	13 12	14 30	15 53	17 17
56	7 33	5 27	12 59	14 19	15 45	17 13
58	7 40	5 27	12 43	14 06	15 36	17 08
60	7 49	5 27	12 23	13 52	15 26	17 02
S						

Lat.	Sunset	Twlt. ends	Moonset 11	Moonset 12	Moonset 13	Moonset 14
N °	h m	h m	h m	h m	h m	h m
72	22 06	////	■	■	■	2 33
70	21 28	////	■	■	0 22	3 01
68	21 03	////	■	■	1 10	3 21
66	20 43	////	23 34	25 40	1 40	3 37
64	20 27	////	24 14	0 14	2 03	3 51
62	20 14	////	24 42	0 42	2 21	4 02
60	20 03	////	25 03	1 03	2 36	4 11
58	19 53	////	0 01	1 21	2 48	4 19
56	19 45	23 06	0 19	1 35	2 59	4 26
54	19 37	22 27	0 34	1 48	3 09	4 33
52	19 31	22 02	0 47	1 59	3 17	4 38
50	19 25	21 43	0 59	2 09	3 25	4 44
45	19 12	21 09	1 23	2 29	3 40	4 55
40	19 01	20 44	1 41	2 46	3 54	5 04
35	18 52	20 26	1 57	3 00	4 05	5 11
30	18 44	20 11	2 11	3 12	4 14	5 18
20	18 31	19 49	2 34	3 32	4 31	5 30
10	18 19	19 32	2 54	3 50	4 45	5 40
0	18 08	19 19	3 13	4 06	4 58	5 50
10	17 58	19 10	3 32	4 23	5 12	5 59
20	17 47	19 02	3 52	4 40	5 26	6 09
30	17 34	18 55	4 14	5 00	5 42	6 20
35	17 26	18 52	4 28	5 12	5 51	6 26
40	17 18	18 50	4 43	5 25	6 01	6 34
45	17 08	18 48	5 01	5 40	6 14	6 42
50	16 56	18 46	5 24	6 00	6 28	6 52
52	16 51	18 46	5 35	6 09	6 35	6 57
54	16 45	18 46	5 47	6 19	6 43	7 02
56	16 38	18 45	6 01	6 30	6 51	7 08
58	16 31	18 46	6 17	6 43	7 01	7 14
60	16 22	18 46	6 37	6 58	7 12	7 21
S						

GMT	Equation of Time (App.—Mean) 11	12	13
h	m s	m s	m s
0	− 5 15.8	− 5 06.4	− 4 56.5
6	− 5 13.5	− 5 04.0	− 4 53.9
12	− 5 11.2	− 5 01.5	− 4 51.3
18	− 5 08.8	− 4 59.0	− 4 48.6
24	− 5 06.4	− 4 56.5	− 4 45.9

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
11	21 54	14 52	20 27	9 59	16 51
12	22 46	14 52	20 23	9 56	16 47
13	23 37	14 52	20 20	9 53	16 43
14	24 28	14 52	20 17	9 50	16 39

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.1	0.2	0.3
30			
	0.1	0.1	0.2
45			
	0.1	0.1	0.2
60			
	0.1	0.1	0.1
75			
	0.1	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	11	12	13
°	′	′	′
0			
	14.9	15.8	16.7
4			
	14.9	15.8	16.7
8			
	14.9	15.8	16.7
12			
	14.9	15.8	16.7
16			
	14.9	15.8	16.7
20			
	15.0	15.8	16.6
24			
	15.0	15.8	16.6
28			
	15.0	15.8	16.6
32			
	15.0	15.8	16.5
36			
	15.0	15.8	16.5
40			
	15.0	15.8	16.5
44			
	15.1	15.7	16.4
48			
	15.1	15.7	16.4
52			
	15.1	15.7	16.3
56			
	15.1	15.7	16.3
60			
	15.2	15.7	16.2
64			
	15.2	15.7	16.2
68			
	15.2	15.7	16.1
72			
	15.3	15.7	16.0
76			
	15.3	15.6	16.0
80			
	15.3	15.6	15.9
84			
	15.4	15.6	15.9
88			
	15.4	15.6	15.8
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	11	12	13
°	′	′	′
0			
	15.9	15.4	14.9
4			
	15.9	15.4	14.9
8			
	15.9	15.4	14.9
12			
	15.9	15.4	14.9
16			
	15.9	15.4	14.9
20			
	15.9	15.4	15.0
24			
	15.9	15.4	15.0
28			
	15.8	15.4	15.0
32			
	15.8	15.4	15.0
36			
	15.8	15.4	15.1
40			
	15.8	15.5	15.1
44			
	15.8	15.5	15.2
48			
	15.7	15.5	15.2
52			
	15.7	15.5	15.3
56			
	15.7	15.5	15.3
60			
	15.6	15.5	15.4
64			
	15.6	15.5	15.4
68			
	15.6	15.5	15.5
72			
	15.6	15.6	15.5
76			
	15.5	15.6	15.6
80			
	15.5	15.6	15.7
84			
	15.4	15.6	15.7
88			
	15.4	15.6	15.8
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −3.8 GHA	Dec.	MARS −1.4 GHA	Dec.	JUPITER −1.5 GHA	Dec.	SATURN 0.9 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
14 0	321 52.9	137 04.9	− 2 30.5	55 01.9	−28 02.7	212 14.3	+22 15.5	109 30.1	−10 36.0	5 27.1	104	−13 54.3	+126
1	336 55.4	152 05.0	31.7	70 03.8	02.6	227 16.2	15.5	124 32.5	36.0	19 56.5	104	13 41.7	+126
2	351 57.8	167 05.0	33.0	85 05.7	02.6	242 18.1	15.4	139 34.8	36.1	34 25.9	105	13 29.1	+127
3	7 00.3	182 05.1	•• 34.3	100 07.6	•• 02.5	257 20.0	•• 15.3	154 37.1	•• 36.1	48 55.4	105	·13 16.4	+127
4	22 02.8	197 05.2	35.5	115 09.4	02.5	272 21.9	15.3	169 39.4	36.2	63 24.9	105	13 03.7	+129
5	37 05.2	212 05.2	36.8	130 11.3	02.4	287 23.8	15.2	184 41.8	36.3	77 54.4	105	12 50.8	+129
6	52 07.7	227 05.3	− 2 38.0	145 13.2	−28 02.4	302 25.8	+22 15.1	199 44.1	−10 36.3	92 23.9	106	−12 37.9	+130
7	67 10.1	242 05.4	39.3	160 15.1	02.3	317 27.7	15.1	214 46.4	36.4	106 53.5	105	12 24.9	+131
8	82 12.6	257 05.5	40.5	175 16.9	02.3	332 29.6	15.0	229 48.7	36.4	121 23.0	106	12 11.8	+132
9	97 15.1	272 05.5	•• 41.8	190 18.8	•• 02.2	347 31.5	•• 14.9	244 51.1	•• 36.5	135 52.6	107	·11 58.6	+132
10	112 17.5	287 05.6	43.0	205 20.7	02.2	2 33.4	14.9	259 53.4	36.6	150 22.3	106	11 45.4	+134
11	127 20.0	302 05.7	44.3	220 22.5	02.1	17 35.3	14.8	274 55.7	36.6	164 51.9	107	11 32.0	+133
12	142 22.5	317 05.8	− 2 45.6	235 24.4	−28 02.1	32 37.2	+22 14.8	289 58.0	−10 36.7	179 21.6	107	−11 18.7	+135
13	157 24.9	332 05.8	46.8	250 26.3	02.0	47 39.1	14.7	305 00.3	36.7	193 51.3	108	11 05.2	+135
14	172 27.4	347 05.9	48.1	265 28.1	02.0	62 41.0	14.6	320 02.7	36.8	208 21.1	107	10 51.7	+136
15	187 29.9	2 06.0	•• 49.3	280 30.0	•• 01.9	77 42.9	•• 14.6	335 05.0	•• 36.9	222 50.8	108	·10 38.1	+137
16	202 32.3	17 06.1	50.6	295 31.9	01.9	92 44.9	14.5	350 07.3	36.9	237 20.6	108	10 24.4	+137
17	217 34.8	32 06.1	51.8	310 33.7	01.8	107 46.8	14.4	5 09.6	37.0	251 50.4	108	10 10.7	+138
18	232 37.2	47 06.2	− 2 53.1	325 35.6	−28 01.7	122 48.7	+22 14.4	20 12.0	−10 37.0	266 20.2	108	− 9 56.9	+139
19	247 39.7	62 06.3	54.3	340 37.4	01.7	137 50.6	14.3	35 14.3	37.1	280 50.0	109	9 43.0	+139
20	262 42.2	77 06.4	55.6	355 39.3	01.6	152 52.5	14.2	50 16.6	37.2	295 19.9	109	9 29.1	+140
21	277 44.6	92 06.5	•• 56.9	10 41.2	•• 01.6	167 54.4	•• 14.2	65 18.9	•• 37.2	309 49.8	109	· 9 15.1	+140
22	292 47.1	107 06.5	58.1	25 43.0	01.5	182 56.3	14.1	80 21.2	37.3	324 19.7	109	9 01.1	+141
23	307 49.6	122 06.6	2 59.4	40 44.9	01.5	197 58.2	14.0	95 23.6	37.3	338 49.6	109	8 47.0	+142
15 0	322 52.0	137 06.7	− 3 00.6	55 46.7	−28 01.4	213 00.2	+22 14.0	110 25.9	−10 37.4	353 19.5	109	− 8 32.8	+142
1	337 54.5	152 06.8	01.9	70 48.6	01.4	228 02.1	13.9	125 28.2	37.5	7 49.4	110	8 18.6	+142
2	352 57.0	167 06.8	03.1	85 50.4	01.3	243 04.0	13.8	140 30.5	37.5	22 19.4	110	8 04.4	+144
3	7 59.4	182 06.9	•• 04.4	100 52.3	•• 01.3	258 05.9	•• 13.8	155 32.9	•• 37.6	36 49.4	110	· 7 50.0	+143
4	23 01.9	197 07.0	05.6	115 54.1	01.2	273 07.8	13.7	170 35.2	37.7	51 19.4	110	7 35.7	+144
5	38 04.4	212 07.1	06.9	130 56.0	01.2	288 09.7	13.6	185 37.5	37.7	65 49.4	110	7 21.3	+145
6	53 06.8	227 07.2	− 3 08.1	145 57.8	−28 01.1	303 11.6	+22 13.6	200 39.8	−10 37.8	80 19.4	110	− 7 06.8	+145
7	68 09.3	242 07.2	09.4	160 59.6	01.0	318 13.5	13.5	215 42.1	37.8	94 49.4	111	6 52.3	+146
8	83 11.7	257 07.3	10.6	176 01.5	01.0	333 15.5	13.4	230 44.5	37.9	109 19.5	110	6 37.7	+146
9	98 14.2	272 07.4	•• 11.9	191 03.3	•• 00.9	348 17.4	•• 13.4	245 46.8	•• 38.0	123 49.5	111	· 6 23.1	+146
10	113 16.7	287 07.5	13.1	206 05.2	00.9	3 19.3	13.3	260 49.1	38.0	138 19.6	111	6 08.5	+147
11	128 19.1	302 07.6	14.4	221 07.0	00.8	18 21.2	13.3	275 51.4	38.1	152 49.7	110	5 53.8	+147
12	143 21.6	317 07.7	− 3 15.6	236 08.8	−28 00.8	33 23.1	+22 13.2	290 53.7	−10 38.1	167 19.7	111	− 5 39.1	+148
13	158 24.1	332 07.7	16.9	251 10.7	00.7	48 25.0	13.1	305 56.1	38.2	181 49.8	111	5 24.3	+148
14	173 26.5	347 07.8	18.2	266 12.5	00.7	63 26.9	13.1	320 58.4	38.3	196 19.9	111	5 09.5	+149
15	188 29.0	2 07.9	•• 19.4	281 14.3	•• 00.6	78 28.8	•• 13.0	336 00.7	•• 38.3	210 50.0	111	· 4 54.6	+148
16	203 31.5	17 08.0	20.7	296 16.2	00.5	93 30.8	12.9	351 03.0	38.4	225 20.1	112	4 39.8	+149
17	218 33.9	32 08.1	21.9	311 18.0	00.5	108 32.7	12.9	6 05.3	38.4	239 50.3	111	4 24.9	+150
18	233 36.4	47 08.2	− 3 23.2	326 19.8	−28 00.4	123 34.6	+22 12.8	21 07.7	−10 38.5	254 20.4	111	− 4 09.9	+149
19	248 38.8	62 08.2	24.4	341 21.6	00.4	138 36.5	12.7	36 10.0	38.6	268 50.5	111	3 55.0	+150
20	263 41.3	77 08.3	25.7	356 23.5	00.3	153 38.4	12.7	51 12.3	38.6	283 20.6	111	3 40.0	+151
21	278 43.8	92 08.4	•• 26.9	11 25.3	•• 00.3	168 40.3	•• 12.6	66 14.6	•• 38.7	297 50.7	112	· 3 24.9	+150
22	293 46.2	107 08.5	28.2	26 27.1	00.2	183 42.2	12.5	81 16.9	38.7	312 20.9	111	3 09.9	+151
23	308 48.7	122 08.6	29.4	41 28.9	00.2	198 44.2	12.5	96 19.2	38.8	326 51.0	111	2 54.8	+151
16 0	323 51.2	137 08.7	− 3 30.7	56 30.7	−28 00.1	213 46.1	+22 12.4	111 21.6	−10 38.9	341 21.1	111	− 2 39.7	+151
1	338 53.6	152 08.8	31.9	71 32.6	00.0	228 48.0	12.3	126 23.9	38.9	355 51.2	111	2 24.6	+151
2	353 56.1	167 08.8	33.2	86 34.4	28 00.0	243 49.9	12.3	141 26.2	39.0	10 21.3	112	2 09.5	+152
3	8 58.6	182 08.9	•• 34.4	101 36.2	·27 59.9	258 51.8	•• 12.2	156 28.5	•• 39.1	24 51.5	111	· 1 54.3	+151
4	24 01.0	197 09.0	35.7	116 38.0	59.9	273 53.7	12.1	171 30.8	39.1	39 21.6	111	1 39.2	+152
5	39 03.5	212 09.1	36.9	131 39.8	59.8	288 55.7	12.1	186 33.2	39.2	53 51.7	111	1 24.0	+152
6	54 06.0	227 09.2	− 3 38.2	146 41.6	−27 59.8	303 57.6	+22 12.0	201 35.5	−10 39.2	68 21.8	110	− 1 08.8	+152
7	69 08.4	242 09.3	39.4	161 43.4	59.7	318 59.5	11.9	216 37.8	39.3	82 51.8	111	0 53.6	+152
8	84 10.9	257 09.4	40.7	176 45.2	59.7	334 01.4	11.9	231 40.1	39.4	97 21.9	111	0 38.4	+153
9	99 13.3	272 09.5	•• 41.9	191 47.1	•• 59.6	349 03.3	•• 11.8	246 42.4	•• 39.4	111 52.0	111	· 0 23.1	+152
10	114 15.8	287 09.5	43.2	206 48.9	59.5	4 05.2	11.7	261 44.7	39.5	126 22.1	110	− 0 07.9	+153
11	129 18.3	302 09.6	44.4	221 50.7	59.5	19 07.1	11.7	276 47.1	39.6	140 52.1	110	+ 0 07.4	+152
12	144 20.7	317 09.7	− 3 45.7	236 52.5	−27 59.4	34 09.1	+22 11.6	291 49.4	−10 39.6	155 22.1	111	+ 0 22.6	+153
13	159 23.2	332 09.8	46.9	251 54.3	59.4	49 11.0	11.5	306 51.7	39.7	169 52.2	110	0 37.9	+152
14	174 25.7	347 09.9	48.2	266 56.1	59.3	64 12.9	11.5	321 54.0	39.7	184 22.2	110	0 53.1	+153
15	189 28.1	2 10.0	•• 49.4	281 57.9	•• 59.3	79 14.8	•• 11.4	336 56.3	•• 39.8	198 52.2	109	· 1 08.4	+152
16	204 30.6	17 10.1	50.7	296 59.7	59.2	94 16.7	11.3	351 58.6	39.9	213 22.1	110	1 23.6	+153
17	219 33.1	32 10.2	51.9	312 01.5	59.1	109 18.6	11.3	7 01.0	39.9	227 52.1	109	1 38.9	+152
18	234 35.5	47 10.3	− 3 53.2	327 03.3	−27 59.1	124 20.6	+22 11.2	22 03.3	−10 40.0	242 22.0	110	+ 1 54.1	+152
19	249 38.0	62 10.4	54.4	342 05.0	59.0	139 22.5	11.1	37 05.6	40.0	256 52.0	109	2 09.3	+153
20	264 40.5	77 10.5	55.7	357 06.8	59.0	154 24.4	11.1	52 07.9	40.1	271 21.9	109	2 24.6	+152
21	279 42.9	92 10.5	•• 56.9	12 08.6	•• 58.9	169 26.3	•• 11.0	67 10.2	•• 40.2	285 51.8	108	· 2 39.8	+152
22	294 45.4	107 10.6	58.2	27 10.4	58.9	184 28.2	10.9	82 12.5	40.2	300 21.6	109	2 55.0	+152
23	309 47.8	122 10.7	3 59.4	42 12.2	58.8	199 30.2	10.9	97 14.9	40.3	314 51.5	108	3 10.2	+152
24	324 50.3	137 10.8	− 4 00.7	57 14.0	−27 58.7	214 32.1	+22 10.8	112 17.2	−10 40.4	329 21.3	108	+ 3 25.4	+151
code	—	0	− 13	+ 19	+ 1	+ 19	− 1	+ 24	− 1				

G M T	SUN GHA	SUN Dec.
h	° ′	° ′
14 0	178 48.6	+14 36.3
1	193 48.7	35.5
2	208 48.8	34.7
3	223 48.9 ..	34.0
4	238 49.0	33.2
5	253 49.1	32.4
6	268 49.3	+14 31.7
7	283 49.4	30.9
8	298 49.5	30.1
9	313 49.6 ..	29.4
10	328 49.7	28.6
11	343 49.8	27.8
12	358 49.9	+14 27.1
13	13 50.1	26.3
14	28 50.2	25.5
15	43 50.3 ..	24.8
16	58 50.4	24.0
17	73 50.5	23.2
18	88 50.6	+14 22.4
19	103 50.8	21.7
20	118 50.9	20.9
21	133 51.0 ..	20.1
22	148 51.1	19.4
23	163 51.2	18.6
15 0	178 51.3	+14 17.8
1	193 51.5	17.0
2	208 51.6	16.3
3	223 51.7 ..	15.5
4	238 51.8	14.7
5	253 51.9	13.9
6	268 52.1	+14 13.2
7	283 52.2	12.4
8	298 52.3	11.6
9	313 52.4 ..	10.8
10	328 52.5	10.1
11	343 52.7	09.3
12	358 52.8	+14 08.5
13	13 52.9	07.7
14	28 53.0	07.0
15	43 53.1 ..	06.2
16	58 53.3	05.4
17	73 53.4	04.6
18	88 53.5	+14 03.8
19	103 53.6	03.1
20	118 53.8	02.3
21	133 53.9 ..	01.5
22	148 54.0	14 00.7
23	163 54.1	13 59.9
16 0	178 54.3	+13 59.2
1	193 54.4	58.4
2	208 54.5	57.6
3	223 54.6 ..	56.8
4	238 54.7	56.0
5	253 54.9	55.2
6	268 55.0	+13 54.5
7	283 55.1	53.7
8	298 55.2	52.9
9	313 55.4 ..	52.1
10	328 55.5	51.3
11	343 55.6	50.5
12	358 55.8	+13 49.7
13	13 55.9	49.0
14	28 56.0	48.2
15	43 56.1 ..	47.4
16	58 56.3	46.6
17	73 56.4	45.8
18	88 56.5	+13 45.0
19	103 56.6	44.2
20	118 56.8	43.4
21	133 56.9 ..	42.6
22	148 57.0	41.9
23	163 57.2	41.1
24	178 57.3	+13 40.3
code	–	– 8

STARS

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.6	−40 28.7
5	Achernar	335 59.1	−57 27.6
30	Acrux	173 59.3	−62 51.2
19	Adhara	255 47.5	−28 54.4
10	Aldebaran	291 40.1	+16 25.3
32	Alioth	166 59.5	+56 12.5
34	Alkaid	153 33.6	+49 32.5
55	Al Na'ir	28 38.4	−47 10.7
15	Alnilam	276 31.3	− 1 13.6
25	Alphard	218 39.7	− 8 27.6
41	Alphecca	126 48.3	+26 52.1
1	Alpheratz	358 28.9	+28 50.5
51	Altair	62 50.9	+ 8 45.0
2	Ankaa	353 58.7	−42 32.8
42	Antares	113 20.3	−26 20.1
37	Arcturus	146 36.0	+19 25.2
43	Atria	109 01.5	−68 57.2
22	Avior	234 36.8	−59 21.7
13	Bellatrix	279 19.5	+ 6 18.7
16	Betelg'se	271 49.2	+ 7 24.1
17	Canopus	264 16.1	−52 39.9
12	Capella	281 39.9	+45 57.2
53	Deneb	50 01.1	+45 07.2
28	Denebola	183 18.8	+14 49.6
4	Diphda	349 39.8	−18 13.8
27	Dubhe	194 46.1	+61 59.9
14	Elnath	279 08.5	+28 34.3
47	Eltanin	91 06.3	+51 29.8
54	Enif	34 30.1	+ 9 40.1
56	Fomalhaut	16 12.1	−29 51.5
31	Gacrux	172 50.6	−56 51.8
29	Gienah	176 38.0	−17 17.5
35	Hadar	149 50.9	−60 09.6
6	Hamal	328 50.5	+23 15.0
48	Kaus Aust.	84 42.0	−34 24.6
40	Kochab	137 17.9	+74 20.7
57	Markab	14 22.0	+14 57.8
8	Menkar	315 01.1	+ 3 55.0
36	Menkent	148 59.8	−36 09.1
24	Miapl'dus	221 50.3	−69 31.8
9	Mirfak	309 43.6	+49 42.0
50	Nunki	76 52.6	−26 21.3
52	Peacock	54 27.9	−56 52.9
21	Pollux	244 21.9	+28 08.3
20	Procyon	245 46.1	+ 5 20.6
46	R'alhague	96 47.2	+12 35.6
26	Regulus	208 30.7	+12 11.4
11	Rigel	281 54.6	− 8 15.0
38	Rigil Kent.	140 52.3	−60 39.3
44	Sabik	103 03.0	−15 40.3
3	Schedar	350 30.6	+56 17.3
45	Shaula	97 21.6	−37 04.5
18	Sirius	259 12.8	−16 39.0
33	Spica	159 17.9	−10 55.6
23	Suhail	223 25.4	−43 14.9
49	Vega	81 08.5	+38 44.6
39	Zub'g'bi	137 54.3	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 14	Moonrise 15	Moonrise 16	Moonrise 17
N °	h m	h m	h m	h m	h m	h m
72	2 20	////	20 24	19 54	19 27	18 59
70	2 53	////	20 10	19 49	19 30	19 10
68	3 17	////	19 58	19 45	19 33	19 20
66	3 35	////	19 48	19 41	19 35	19 28
64	3 50	////	19 40	19 38	19 36	19 34
62	4 02	////	19 33	19 36	19 38	19 40
60	4 13	////	19 27	19 33	19 39	19 45
58	4 22	////	19 22	19 31	19 40	19 50
56	4 30	1 18	19 17	19 29	19 41	19 54
54	4 37	1 50	19 12	19 28	19 42	19 58
52	4 43	2 13	19 08	19 26	19 43	20 01
50	4 49	2 31	19 05	19 25	19 44	20 04
45	5 01	3 05	18 57	19 22	19 46	20 10
40	5 11	3 28	18 50	19 19	19 47	20 16
35	5 19	3 46	18 45	19 17	19 48	20 21
30	5 27	4 00	18 40	19 15	19 49	20 25
20	5 40	4 22	18 31	19 11	19 51	20 33
10	5 51	4 38	18 23	19 08	19 53	20 39
0	6 01	4 50	18 16	19 06	19 55	20 46
10	6 11	5 00	18 09	19 03	19 57	20 52
20	6 22	5 08	18 01	19 00	19 59	20 59
30	6 34	5 14	17 52	18 56	20 01	21 06
35	6 41	5 16	17 47	18 54	20 02	21 11
40	6 49	5 18	17 41	18 52	20 04	21 16
45	6 58	5 21	17 34	18 49	20 05	21 22
50	7 09	5 21	17 26	18 46	20 07	21 30
52	7 14	5 21	17 22	18 45	20 08	21 33
54	7 20	5 22	17 17	18 43	20 10	21 37
56	7 26	5 21	17 13	18 42	20 11	21 41
58	7 33	5 21	17 08	18 40	20 12	21 46
60	7 40	5 20	17 02	18 37	20 14	21 51
S						

Lat.	Sunset	Twlt. ends	Moonset 14	Moonset 15	Moonset 16	Moonset 17
N °	h m	h m	h m	h m	h m	h m
72	21 43	////	2 33	5 01	7 17	9 33
70	21 11	////	3 01	5 13	7 18	9 24
68	20 49	////	3 21	5 22	7 20	9 18
66	20 31	////	3 37	5 30	7 21	9 12
64	20 17	////	3 51	5 37	7 21	9 07
62	20 05	////	4 02	5 42	7 22	9 03
60	19 55	////	4 11	5 47	7 23	8 59
58	19 46	23 50	4 19	5 51	7 23	8 56
56	19 38	22 44	4 26	5 55	7 23	8 53
54	19 31	22 13	4 33	5 58	7 24	8 51
52	19 25	21 51	4 38	6 01	7 24	8 48
50	19 19	21 34	4 44	6 04	7 25	8 46
45	19 07	21 02	4 55	6 10	7 25	8 42
40	18 57	20 39	5 04	6 15	7 26	8 38
35	18 49	20 22	5 11	6 19	7 26	8 35
30	18 42	20 08	5 18	6 23	7 27	8 32
20	18 29	19 46	5 30	6 29	7 28	8 27
10	18 18	19 31	5 40	6 34	7 28	8 23
0	18 08	19 19	5 50	6 39	7 29	8 19
10	17 58	19 10	5 59	6 45	7 29	8 15
20	17 47	19 02	6 09	6 50	7 30	8 10
30	17 36	18 57	6 20	6 56	7 31	8 06
35	17 29	18 54	6 26	6 59	7 31	8 03
40	17 21	18 52	6 34	7 03	7 31	8 00
45	17 12	18 51	6 42	7 08	7 32	7 56
50	17 01	18 50	6 52	7 13	7 32	7 52
52	16 56	18 50	6 57	7 15	7 32	7 50
54	16 51	18 51	7 02	7 18	7 33	7 47
56	16 44	18 50	7 08	7 21	7 33	7 45
58	16 38	18 52	7 14	7 24	7 33	7 42
60	16 30	18 52	7 21	7 28	7 34	7 39
S						

Equation of Time (App.—Mean)

GMT	14	15	16
h	m s	m s	m s
0	− 4 45.9	− 4 34.9	− 4 23.2
6	− 4 43.2	− 4 32.0	− 4 20.3
12	− 4 40.5	− 4 29.1	− 4 17.2
18	− 4 37.7	− 4 26.2	− 4 14.2
24	− 4 34.9	− 4 23.2	− 4 11.1

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
14	24 28	14 52	20 17	9 50	16 39
15	0 28	14 52	20 14	9 47	16 36
16	1 17	14 51	20 12	9 44	16 32
17	2 07	14 51	20 09	9 41	16 28

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.1	0.2	0.3
30			
	0.1	0.1	0.2
45			
	0.1	0.1	0.2
60			
	0.1	0.1	0.1
75			
	0.1	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	14	15	16
°	′	′	′
0			
	17.6	18.2	18.7
4			
	17.6	18.2	18.7
8			
	17.6	18.2	18.7
12			
	17.5	18.2	18.7
16			
	17.5	18.1	18.6
20			
	17.5	18.1	18.6
24			
	17.4	18.0	18.5
28			
	17.4	17.9	18.4
32			
	17.3	17.9	18.3
36			
	17.2	17.8	18.2
40			
	17.2	17.7	18.1
44			
	17.1	17.6	18.0
48			
	17.0	17.5	17.8
52			
	16.9	17.4	17.7
56			
	16.8	17.2	17.6
60			
	16.7	17.1	17.4
64			
	16.6	17.0	17.2
68			
	16.5	16.8	17.1
72			
	16.4	16.7	16.9
76			
	16.3	16.6	16.8
80			
	16.2	16.4	16.6
84			
	16.1	16.3	16.4
88			
	16.0	16.2	16.3
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	14	15	16
°	′	′	′
0			
	14.4	14.0	13.7
4			
	14.4	14.0	13.7
8			
	14.4	14.1	13.8
12			
	14.4	14.1	13.8
16			
	14.5	14.1	13.9
20			
	14.5	14.2	13.9
24			
	14.5	14.2	14.0
28			
	14.6	14.3	14.1
32			
	14.7	14.4	14.2
36			
	14.7	14.5	14.3
40			
	14.8	14.6	14.4
44			
	14.9	14.7	14.5
48			
	15.0	14.8	14.6
52			
	15.0	14.9	14.8
56			
	15.1	15.0	14.9
60			
	15.2	15.1	15.1
64			
	15.3	15.3	15.2
68			
	15.4	15.4	15.4
72			
	15.5	15.5	15.5
76			
	15.7	15.7	15.7
80			
	15.8	15.8	15.9
84			
	15.9	16.0	16.1
88			
	16.0	16.1	16.2
90			

Subtract from table, back cover

Full Moon 14

GMT	♈ GHA	VENUS −3.8 GHA	VENUS Dec.	MARS −1.3 GHA	MARS Dec.	JUPITER −1.5 GHA	JUPITER Dec.	SATURN 0.9 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
17 0	324 50.3	137 10.8	− 4 00.7	57 14.0	−27 58.7	214 32.1	+22 10.8	112 17.2	−10 40.4	329 21.3	108	+ 3 25.4	+151
1	339 52.8	152 10.9	01.9	72 15.8	58.7	229 34.0	10.7	127 19.5	40.4	343 51.1	107	3 40.5	+152
2	354 55.2	167 11.0	03.2	87 17.6	58.6	244 35.9	10.7	142 21.8	40.5	358 20.8	108	3 55.7	+151
3	9 57.7	182 11.1	·· 04.4	102 19.4	·· 58.6	259 37.8	·· 10.6	157 24.1	·· 40.5	12 50.6	107	· 4 10.8	+151
4	25 00.2	197 11.2	05.7	117 21.1	58.5	274 39.7	10.5	172 26.4	40.6	27 20.3	107	4 25.9	+151
5	40 02.6	212 11.3	06.9	132 22.9	58.5	289 41.7	10.5	187 28.7	40.7	41 50.0	106	4 41.0	+151
6	55 05.1	227 11.4	− 4 08.1	147 24.7	−27 58.4	304 43.6	+22 10.4	202 31.1	−10 40.7	56 19.6	106	+ 4 56.1	+150
7	70 07.6	242 11.5	09.4	162 26.5	58.3	319 45.5	10.3	217 33.4	40.8	70 49.2	106	5 11.1	+150
8	85 10.0	257 11.6	10.6	177 28.2	58.3	334 47.4	10.3	232 35.7	40.9	85 18.8	106	5 26.1	+150
9	100 12.5	272 11.7	·· 11.9	192 30.0	·· 58.2	349 49.3	·· 10.2	247 38.0	·· 40.9	99 48.4	105	· 5 41.1	+150
10	115 14.9	287 11.8	13.1	207 31.8	58.2	4 51.2	10.2	262 40.3	41.0	114 17.9	105	5 56.1	+149
11	130 17.4	302 11.9	14.4	222 33.6	58.1	19 53.2	10.1	277 42.6	41.0	128 47.4	105	6 11.0	+149
12	145 19.9	317 12.0	− 4 15.6	237 35.3	−27 58.1	34 55.1	+22 10.0	292 44.9	−10 41.1	143 16.9	104	+ 6 25.9	+149
13	160 22.3	332 12.1	16.9	252 37.1	58.0	49 57.0	10.0	307 47.3	41.2	157 46.3	104	6 40.8	+148
14	175 24.8	347 12.2	18.1	267 38.9	57.9	64 58.9	09.9	322 49.6	41.2	172 15.7	104	6 55.6	+148
15	190 27.3	2 12.3	·· 19.4	282 40.6	·· 57.9	80 00.8	·· 09.8	337 51.9	·· 41.3	186 45.1	103	· 7 10.4	+147
16	205 29.7	17 12.4	20.6	297 42.4	57.8	95 02.8	09.8	352 54.2	41.4	201 14.4	103	7 25.1	+147
17	220 32.2	32 12.4	21.9	312 44.2	57.8	110 04.7	09.7	7 56.5	41.4	215 43.7	102	7 39.8	+147
18	235 34.7	47 12.5	− 4 23.1	327 45.9	−27 57.7	125 06.6	+22 09.6	22 58.8	−10 41.5	230 12.9	102	+ 7 54.5	+146
19	250 37.1	62 12.6	24.4	342 47.7	57.6	140 08.5	09.6	38 01.1	41.6	244 42.1	101	8 09.1	+146
20	265 39.6	77 12.7	25.6	357 49.5	57.6	155 10.4	09.5	53 03.4	41.6	259 11.2	102	8 23.7	+145
21	280 42.1	92 12.8	·· 26.8	12 51.2	·· 57.5	170 12.4	·· 09.4	68 05.8	·· 41.7	273 40.4	100	· 8 38.2	+145
22	295 44.5	107 12.9	28.1	27 53.0	57.5	185 14.3	09.4	83 08.1	41.7	288 09.4	101	8 52.7	+145
23	310 47.0	122 13.0	29.3	42 54.7	57.4	200 16.2	09.3	98 10.4	41.8	302 38.5	99	9 07.2	+143
18 0	325 49.4	137 13.1	− 4 30.6	57 56.5	−27 57.3	215 18.1	+22 09.2	113 12.7	−10 41.9	317 07.4	100	+ 9 21.5	+144
1	340 51.9	152 13.2	31.8	72 58.2	57.3	230 20.0	09.2	128 15.0	41.9	331 36.4	99	9 35.9	+142
2	355 54.4	167 13.3	33.1	88 00.0	57.2	245 22.0	09.1	143 17.3	42.0	346 05.3	98	9 50.1	+143
3	10 56.8	182 13.4	·· 34.3	103 01.7	·· 57.2	260 23.9	·· 09.0	158 19.6	·· 42.1	0 34.1	98	·10 04.4	+141
4	25 59.3	197 13.5	35.6	118 03.5	57.1	275 25.8	09.0	173 21.9	42.1	15 02.9	97	10 18.5	+141
5	41 01.8	212 13.6	36.8	133 05.2	57.0	290 27.7	08.9	188 24.2	42.2	29 31.6	97	10 32.6	+141
6	56 04.2	227 13.7	− 4 38.0	148 07.0	−27 57.0	305 29.6	+22 08.8	203 26.6	−10 42.3	44 00.3	97	+10 46.7	+139
7	71 06.7	242 13.9	39.3	163 08.7	56.9	320 31.6	08.8	218 28.9	42.3	58 29.0	96	11 00.6	+140
8	86 09.2	257 14.0	40.5	178 10.5	56.9	335 33.5	08.7	233 31.2	42.4	72 57.6	95	11 14.6	+138
9	101 11.6	272 14.1	·· 41.8	193 12.2	·· 56.8	350 35.4	·· 08.6	248 33.5	·· 42.4	87 26.1	95	·11 28.4	+138
10	116 14.1	287 14.2	43.0	208 14.0	56.7	5 37.3	08.6	263 35.8	42.5	101 54.6	95	11 42.2	+137
11	131 16.6	302 14.3	44.3	223 15.7	56.7	20 39.3	08.5	278 38.1	42.6	116 23.1	93	11 55.9	+137
12	146 19.0	317 14.4	− 4 45.5	238 17.5	−27 56.6	35 41.2	+22 08.4	293 40.4	−10 42.6	130 51.4	94	+12 09.6	+135
13	161 21.5	332 14.5	46.7	253 19.2	56.6	50 43.1	08.4	308 42.7	42.7	145 19.8	93	12 23.1	+135
14	176 23.9	347 14.6	48.0	268 20.9	56.5	65 45.0	08.3	323 45.0	42.8	159 48.1	92	12 36.6	+135
15	191 26.4	2 14.7	·· 49.2	283 22.7	·· 56.4	80 46.9	·· 08.2	338 47.4	·· 42.8	174 16.3	91	·12 50.1	+133
16	206 28.9	17 14.8	50.5	298 24.4	56.4	95 48.9	08.2	353 49.7	42.9	188 44.4	91	13 03.4	+133
17	221 31.3	32 14.9	51.7	313 26.1	56.3	110 50.8	08.1	8 52.0	43.0	203 12.5	91	13 16.7	+132
18	236 33.8	47 15.0	− 4 53.0	328 27.9	−27 56.3	125 52.7	+22 08.0	23 54.3	−10 43.0	217 40.6	90	+13 29.9	+131
19	251 36.3	62 15.1	54.2	343 29.6	56.2	140 54.6	08.0	38 56.6	43.1	232 08.6	89	13 43.0	+130
20	266 38.7	77 15.2	55.4	358 31.3	56.1	155 56.6	07.9	53 58.9	43.2	246 36.5	89	13 56.0	+130
21	281 41.2	92 15.3	·· 56.7	13 33.1	·· 56.1	170 58.5	·· 07.8	69 01.2	·· 43.2	261 04.4	88	·14 09.0	+128
22	296 43.7	107 15.4	57.9	28 34.8	56.0	186 00.4	07.8	84 03.5	43.3	275 32.2	88	14 21.8	+128
23	311 46.1	122 15.5	4 59.2	43 36.5	56.0	201 02.3	07.7	99 05.8	43.3	290 00.0	87	14 34.6	+127
19 0	326 48.6	137 15.6	− 5 00.4	58 38.2	−27 55.9	216 04.2	+22 07.6	114 08.1	−10 43.4	304 27.7	86	+14 47.3	+126
1	341 51.0	152 15.7	01.6	73 40.0	55.8	231 06.2	07.6	129 10.4	43.5	318 55.3	86	14 59.9	+125
2	356 53.5	167 15.8	02.9	88 41.7	55.8	246 08.1	07.5	144 12.7	43.5	333 22.9	85	15 12.4	+124
3	11 56.0	182 16.0	·· 04.1	103 43.4	·· 55.7	261 10.0	·· 07.4	159 15.1	·· 43.6	347 50.4	85	·15 24.8	+123
4	26 58.4	197 16.1	05.4	118 45.1	55.7	276 11.9	07.4	174 17.4	43.7	2 17.9	84	15 37.1	+122
5	42 00.9	212 16.2	06.6	133 46.8	55.6	291 13.9	07.3	189 19.7	43.7	16 45.3	83	15 49.3	+122
6	57 03.4	227 16.3	− 5 07.8	148 48.6	−27 55.5	306 15.8	+22 07.2	204 22.0	−10 43.8	31 12.6	83	+16 01.5	+120
7	72 05.8	242 16.4	09.1	163 50.3	55.5	321 17.7	07.1	219 24.3	43.9	45 39.9	82	16 13.5	+119
8	87 08.3	257 16.5	10.3	178 52.0	55.4	336 19.6	07.1	234 26.6	43.9	60 07.1	81	16 25.4	+118
9	102 10.8	272 16.6	·· 11.6	193 53.7	·· 55.3	351 21.6	·· 07.0	249 28.9	·· 44.0	74 34.2	81	·16 37.2	+118
10	117 13.2	287 16.7	12.8	208 55.4	55.3	6 23.5	06.9	264 31.2	44.1	89 01.3	80	16 49.0	+116
11	132 15.7	302 16.8	14.0	223 57.1	55.2	21 25.4	06.9	279 33.5	44.1	103 28.3	80	17 00.6	+115
12	147 18.2	317 16.9	− 5 15.3	238 58.8	−27 55.2	36 27.3	+22 06.8	294 35.8	−10 44.2	117 55.3	79	+17 12.1	+114
13	162 20.6	332 17.0	16.5	254 00.5	55.1	51 29.3	06.7	309 38.1	44.3	132 22.2	78	17 23.5	+113
14	177 23.1	347 17.2	17.8	269 02.3	55.0	66 31.2	06.7	324 40.4	44.3	146 49.0	78	17 34.8	+112
15	192 25.5	2 17.3	·· 19.0	284 04.0	·· 55.0	81 33.1	·· 06.6	339 42.7	·· 44.4	161 15.8	77	·17 46.0	+110
16	207 28.0	17 17.4	20.2	299 05.7	54.9	96 35.0	06.5	354 45.1	44.4	175 42.5	76	17 57.0	+110
17	222 30.5	32 17.5	21.5	314 07.4	54.8	111 37.0	06.5	9 47.4	44.5	190 09.1	76	18 08.0	+109
18	237 32.9	47 17.6	− 5 22.7	329 09.1	−27 54.8	126 38.9	+22 06.4	24 49.7	−10 44.6	204 35.7	75	+18 18.9	+107
19	252 35.4	62 17.7	23.9	344 10.8	54.7	141 40.8	06.3	39 52.0	44.6	219 02.2	75	18 29.6	+106
20	267 37.9	77 17.8	25.2	359 12.5	54.7	156 42.7	06.3	54 54.3	44.7	233 28.7	74	18 40.2	+105
21	282 40.3	92 17.9	·· 26.4	14 14.2	·· 54.6	171 44.7	·· 06.2	69 56.6	·· 44.8	247 55.1	73	·18 50.7	+104
22	297 42.8	107 18.1	27.7	29 15.9	54.5	186 46.6	06.1	84 58.9	44.8	262 21.4	73	19 01.1	+102
23	312 45.3	122 18.2	28.9	44 17.6	54.5	201 48.5	06.1	100 01.2	44.9	276 47.7	72	19 11.3	+102
24	327 47.7	137 18.3	− 5 30.1	59 19.3	−27 54.4	216 50.4	+22 06.0	115 03.5	−10 45.0	291 13.9	71	+19 21.5	+100
code	—	+ 1	− 12	+ 17	0	+ 19	0	+ 23	− 1				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
17 0	178 57.3	+13 40.3
1	193 57.4	39.5
2	208 57.5	38.7
3	223 57.7	.. 37.9
4	238 57.8	37.1
5	253 57.9	36.3
6	268 58.1	+13 35.5
7	283 58.2	34.7
8	298 58.3	33.9
9	313 58.5	.. 33.1
10	328 58.6	32.3
11	343 58.7	31.5
12	358 58.9	+13 30.7
13	13 59.0	29.9
14	28 59.1	29.1
15	43 59.2	.. 28.4
16	58 59.4	27.6
17	73 59.5	26.8
18	88 59.6	+13 26.0
19	103 59.8	25.2
20	118 59.9	24.4
21	134 00.0	.. 23.6
22	149 00.2	22.8
23	164 00.3	22.0
18 0	179 00.5	+13 21.2
1	194 00.6	20.4
2	209 00.7	19.6
3	224 00.9	.. 18.8
4	239 01.0	18.0
5	254 01.1	17.2
6	269 01.3	+13 16.4
7	284 01.4	15.6
8	299 01.5	14.7
9	314 01.7	.. 13.9
10	329 01.8	13.1
11	344 01.9	12.3
12	359 02.1	+13 11.5
13	14 02.2	10.7
14	29 02.4	09.9
15	44 02.5	.. 09.1
16	59 02.6	08.3
17	74 02.8	07.5
18	89 02.9	+13 06.7
19	104 03.0	05.9
20	119 03.2	05.1
21	134 03.3	.. 04.3
22	149 03.5	03.5
23	164 03.6	02.7
19 0	179 03.7	+13 01.8
1	194 03.9	01.0
2	209 04.0	13 00.2
3	224 04.2	·12 59.4
4	239 04.3	58.6
5	254 04.4	57.8
6	269 04.6	+12 57.0
7	284 04.7	56.2
8	299 04.9	55.4
9	314 05.0	.. 54.5
10	329 05.1	53.7
11	344 05.3	52.9
12	359 05.4	+12 52.1
13	14 05.6	51.3
14	29 05.7	50.5
15	44 05.9	.. 49.7
16	59 06.0	48.8
17	74 06.1	48.0
18	89 06.3	+12 47.2
19	104 06.4	46.4
20	119 06.6	45.6
21	134 06.7	.. 44.8
22	149 06.9	44.0
23	164 07.0	43.1
24	179 07.1	+12 42.3
code	—	− 8

STARS No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.6	−40 28.7
5	Achernar	335 59.1	−57 27.6
30	Acrux	173 59.3	−62 51.1
19	Adhara	255 47.5	−28 54.3
10	Aldebaran	291 40.1	+16 25.3
32	Alioth	166 59.5	+56 12.5
34	Alkaid	153 33.7	+49 32.5
55	Al Na'ir	28 38.4	−47 10.7
15	Alnilam	276 31.3	− 1 13.6
25	Alphard	218 39.7	− 8 27.6
41	Alphecca	126 48.3	+26 52.1
1	Alpheratz	358 28.9	+28 50.5
51	Altair	62 50.9	+ 8 45.0
2	Ankaa	353 58.7	−42 32.8
42	Antares	113 20.3	−26 20.1
37	Arcturus	146 36.0	+19 25.2
43	Atria	109 01.6	−68 57.2
22	Avior	234 36.8	−59 21.7
13	Bellatrix	279 19.4	+ 6 18.7
16	Betelg'se	271 49.2	+ 7 24.1
17	Canopus	264 16.1	−52 39.9
12	Capella	281 39.8	+45 57.2
53	Deneb	50 01.1	+45 07.2
28	Denebola	183 18.8	+14 49.6
4	Diphda	349 39.8	−18 13.8
27	Dubhe	194 46.1	+61 59.8
14	Elnath	279 08.5	+28 34.3
47	Eltanin	91 06.3	+51 29.8
54	Enif	34 30.1	+ 9 40.2
56	Fomalhaut	16 12.1	−29 51.5
31	Gacrux	172 50.7	−56 51.8
29	Gienah	176 38.0	−17 17.5
35	Hadar	149 50.9	−60 09.6
6	Hamal	328 50.4	+23 15.0
48	Kaus Aust.	84 42.0	−34 24.6
40	Kochab	137 17.9	+74 20.7
57	Markab	14 22.0	+14 57.8
8	Menkar	315 01.1	+ 3 55.0
36	Menkent	148 59.8	−36 09.1
24	Miapl'dus	221 50.3	−69 31.8
9	Mirfak	309 43.6	+49 42.0
50	Nunki	76 52.6	−26 21.3
52	Peacock	54 27.9	−56 52.9
21	Pollux	244 21.9	+28 08.3
20	Procyon	245 46.1	+ 5 20.6
46	R'alhague	96 47.2	+12 35.6
26	Regulus	208 30.7	+12 11.4
11	Rigel	281 54.5	− 8 14.9
38	Rigil Kent.	140 52.3	−60 39.3
44	Sabik	103 03.0	−15 40.3
3	Schedar	350 30.6	+56 17.3
45	Shaula	97 21.6	−37 04.5
18	Sirius	259 12.8	−16 39.0
33	Spica	159 17.9	−10 55.6
23	Suhail	223 25.4	−43 14.9
49	Vega	81 08.5	+38 44.6
39	Zub'g'bi	137 54.3	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 17	Moonrise 18	Moonrise 19	Moonrise 20
N °	h m	h m	h m	h m	h m	h m
72	2 41	////	18 59	18 21	16 39	□
70	3 09	////	19 10	18 46	18 04	□
68	3 30	////	19 20	19 05	18 44	17 44
66	3 46	////	19 28	19 20	19 11	18 58
64	3 59	////	19 34	19 33	19 33	19 35
62	4 10	////	19 40	19 44	19 50	20 02
60	4 20	////	19 45	19 53	20 04	20 23
58	4 28	0 50	19 50	20 01	20 17	20 40
56	4 36	1 36	19 54	20 09	20 28	20 54
54	4 42	2 02	19 58	20 15	20 37	21 07
52	4 48	2 23	20 01	20 21	20 46	21 18
50	4 53	2 40	20 04	20 26	20 53	21 28
45	5 04	3 10	20 10	20 38	21 10	21 48
40	5 14	3 32	20 16	20 48	21 23	22 05
35	5 22	3 49	20 21	20 56	21 35	22 20
30	5 29	4 03	20 25	21 03	21 45	22 32
20	5 41	4 23	20 33	21 16	22 03	22 54
10	5 51	4 39	20 39	21 27	22 18	23 12
0	6 01	4 50	20 46	21 38	22 32	23 30
10	6 10	4 59	20 52	21 48	22 47	23 47
20	6 20	5 07	20 59	22 00	23 03	24 06
30	6 31	5 11	21 06	22 13	23 21	24 28
35	6 38	5 14	21 11	22 21	23 32	24 41
40	6 45	5 15	21 16	22 30	23 44	24 56
45	6 53	5 16	21 22	22 40	23 58	25 14
50	7 04	5 16	21 30	22 53	24 16	0 16
52	7 08	5 16	21 33	22 59	24 25	0 25
54	7 13	5 16	21 37	23 05	24 34	0 34
56	7 19	5 15	21 41	23 13	24 45	0 45
58	7 25	5 15	21 46	23 21	24 57	0 57
60	7 33	5 13	21 51	23 31	25 11	1 11
S						

Lat.	Sunset	Twlt. ends	Moonset 17	Moonset 18	Moonset 19	Moonset 20
N °	h m	h m	h m	h m	h m	h m
72	21 22	////	9 33	12 00	15 35	□
70	20 55	////	9 24	11 37	14 12	□
68	20 35	////	9 18	11 20	13 34	16 33
66	20 19	////	9 12	11 06	13 08	15 19
64	20 06	////	9 07	10 55	12 47	14 43
62	19 55	////	9 03	10 46	12 31	14 17
60	19 46	////	8 59	10 38	12 18	13 57
58	19 38	23 07	8 56	10 30	12 06	13 40
56	19 31	22 26	8 53	10 24	11 56	13 27
54	19 24	22 00	8 51	10 19	11 47	13 14
52	19 19	21 41	8 48	10 14	11 39	13 04
50	19 14	21 25	8 46	10 09	11 32	12 54
45	19 02	20 55	8 42	9 59	11 17	12 34
40	18 53	20 33	8 38	9 51	11 05	12 18
35	18 46	20 18	8 35	9 44	10 55	12 05
30	18 39	20 04	8 32	9 38	10 45	11 53
20	18 27	19 44	8 27	9 28	10 30	11 33
10	18 17	19 29	8 23	9 19	10 16	11 16
0	18 07	19 18	8 19	9 10	10 03	10 59
10	17 58	19 09	8 15	9 01	9 51	10 43
20	17 48	19 02	8 10	8 52	9 37	10 26
30	17 37	18 58	8 06	8 42	9 22	10 06
35	17 31	18 56	8 03	8 36	9 13	9 55
40	17 24	18 55	8 00	8 30	9 03	9 42
45	17 15	18 54	7 56	8 22	8 51	9 26
50	17 05	18 54	7 52	8 13	8 37	9 07
52	17 01	18 55	7 50	8 08	8 30	8 58
54	16 55	18 54	7 47	8 04	8 23	8 48
56	16 50	18 56	7 45	7 58	8 15	8 37
58	16 43	18 56	7 42	7 53	8 06	8 24
60	16 36	18 57	7 39	7 46	7 55	8 09
S						

GMT	Equation of Time (App.—Mean) 17	18	19
h	m s	m s	m s
0	− 4 11.1	− 3 58.5	− 3 45.3
6	− 4 08.0	− 3 55.2	− 3 42.0
12	− 4 04.8	− 3 52.0	− 3 38.6
18	− 4 01.7	− 3 48.7	− 3 35.2
24	− 3 58.5	− 3 45.3	− 3 31.7

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
17	2 07	14 51	20 09	9 41	16 28
18	2 58	14 51	20 06	9 38	16 25
19	3 51	14 51	20 03	9 35	16 21
20	4 46	14 51	20 01	9 31	16 17

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.1	0.2	0.3
30			
	0.1	0.1	0.2
45			
	0.1	0.1	0.2
60			
	0.1	0.1	0.1
75			
	0.1	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	17	18	19
°	′	′	′
0			
	19.0	19.0	18.9
4			
	19.0	19.0	18.8
8			
	18.9	18.9	18.8
12			
	18.9	18.9	18.8
16			
	18.9	18.9	18.7
20			
	18.8	18.8	18.7
24			
	18.7	18.7	18.6
28			
	18.6	18.6	18.5
32			
	18.5	18.5	18.4
36			
	18.4	18.4	18.3
40			
	18.3	18.3	18.2
44			
	18.2	18.2	18.1
48			
	18.0	18.0	17.9
52			
	17.9	17.9	17.8
56			
	17.7	17.7	17.6
60			
	17.6	17.6	17.5
64			
	17.4	17.4	17.3
68			
	17.2	17.2	17.1
72			
	17.0	17.0	17.0
76			
	16.8	16.8	16.8
80			
	16.7	16.7	16.6
84			
	16.5	16.5	16.4
88			
	16.3	16.3	16.3
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	17	18	19
°	′	′	′
0			
	13.6	13.6	13.7
4			
	13.6	13.6	13.7
8			
	13.6	13.6	13.7
12			
	13.7	13.7	13.7
16			
	13.7	13.7	13.8
20			
	13.8	13.8	13.8
24			
	13.9	13.9	13.9
28			
	13.9	13.9	14.0
32			
	14.0	14.0	14.1
36			
	14.2	14.2	14.2
40			
	14.3	14.3	14.3
44			
	14.4	14.4	14.5
48			
	14.5	14.5	14.6
52			
	14.7	14.7	14.7
56			
	14.9	14.9	14.9
60			
	15.0	15.0	15.0
64			
	15.2	15.2	15.2
68			
	15.4	15.4	15.4
72			
	15.5	15.5	15.5
76			
	15.7	15.7	15.7
80			
	15.9	15.9	15.9
84			
	16.1	16.1	16.1
88			
	16.2	16.2	16.2
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −3.8 GHA	VENUS Dec.	MARS −1.2 GHA	MARS Dec.	JUPITER −1.5 GHA	JUPITER Dec.	SATURN 0.9 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
20 0	327 47.7	137 18.3	− 5 30.1	59 19.3	−27 54.4	216 50.4	+22 06.0	115 03.5	−10 45.0	291 13.9	71	+19 21.5	+100
1	342 50.2	152 18.4	31.4	74 21.0	54.3	231 52.4	05.9	130 05.8	45.0	305 40.0	71	19 31.5	+ 99
2	357 52.6	167 18.5	32.6	89 22.6	54.3	246 54.3	05.9	145 08.1	45.1	320 06.1	70	19 41.4	+ 97
3	12 55.1	182 18.6	·· 33.8	104 24.3	·· 54.2	261 56.2	·· 05.8	160 10.4	·· 45.2	334 32.1	70	·19 51.1	+ 97
4	27 57.6	197 18.7	35.1	119 26.0	54.2	276 58.1	05.7	175 12.7	45.2	348 58.1	69	20 00.8	+ 95
5	43 00.0	212 18.8	36.3	134 27.7	54.1	292 00.1	05.7	190 15.0	45.3	3 24.0	68	20 10.3	+ 93
6	58 02.5	227 19.0	− 5 37.5	149 29.4	−27 54.0	307 02.0	+22 05.6	205 17.3	−10 45.4	17 49.8	68	+20 19.6	+ 93
7	73 05.0	242 19.1	38.8	164 31.1	54.0	322 03.9	05.5	220 19.6	45.4	32 15.6	67	20 28.9	+ 91
8	88 07.4	257 19.2	40.0	179 32.8	53.9	337 05.9	05.5	235 21.9	45.5	46 41.3	67	20 38.0	+ 90
9	103 09.9	272 19.3	·· 41.2	194 34.5	·· 53.8	352 07.8	·· 05.4	250 24.2	·· 45.6	61 07.0	66	·20 47.0	+ 88
10	118 12.4	287 19.4	42.5	209 36.1	53.8	7 09.7	05.3	265 26.5	45.6	75 32.6	65	20 55.8	+ 87
11	133 14.8	302 19.5	43.7	224 37.8	53.7	22 11.6	05.3	280 28.9	45.7	89 58.1	65	21 04.5	+ 86
12	148 17.3	317 19.7	− 5 45.0	239 39.5	−27 53.6	37 13.6	+22 05.2	295 31.2	−10 45.8	104 23.6	64	+21 13.1	+ 84
13	163 19.8	332 19.8	46.2	254 41.2	53.6	52 15.5	05.1	310 33.5	45.8	118 49.0	64	21 21.5	+ 83
14	178 22.2	347 19.9	47.4	269 42.9	53.5	67 17.4	05.1	325 35.8	45.9	133 14.4	63	21 29.8	+ 82
15	193 24.7	2 20.0	·· 48.7	284 44.5	·· 53.4	82 19.3	·· 05.0	340 38.1	·· 46.0	147 39.7	63	·21 38.0	+ 80
16	208 27.1	17 20.1	49.9	299 46.2	53.4	97 21.3	04.9	355 40.4	46.0	162 05.0	62	21 46.0	+ 79
17	223 29.6	32 20.3	51.1	314 47.9	53.3	112 23.2	04.9	10 42.7	46.1	176 30.2	61	21 53.9	+ 77
18	238 32.1	47 20.4	− 5 52.4	329 49.5	−27 53.3	127 25.1	+22 04.8	25 45.0	−10 46.2	190 55.3	61	+22 01.6	+ 76
19	253 34.5	62 20.5	53.6	344 51.2	53.2	142 27.1	04.7	40 47.3	46.2	205 20.4	61	22 09.2	+ 74
20	268 37.0	77 20.6	54.8	359 52.9	53.1	157 29.0	04.7	55 49.6	46.3	219 45.5	60	22 16.6	+ 73
21	283 39.5	92 20.7	·· 56.1	14 54.6	·· 53.1	172 30.9	·· 04.6	70 51.9	·· 46.4	234 10.5	60	·22 23.9	+ 72
22	298 41.9	107 20.8	57.3	29 56.2	53.0	187 32.8	04.5	85 54.2	46.4	248 35.5	59	22 31.1	+ 70
23	313 44.4	122 21.0	58.5	44 57.9	52.9	202 34.8	04.5	100 56.5	46.5	263 00.4	58	22 38.1	+ 68
21 0	328 46.9	137 21.1	− 5 59.7	59 59.6	−27 52.9	217 36.7	+22 04.4	115 58.8	−10 46.6	277 25.2	59	+22 44.9	+ 67
1	343 49.3	152 21.2	6 01.0	75 01.2	52.8	232 38.6	04.3	131 01.1	46.6	291 50.1	57	22 51.6	+ 66
2	358 51.8	167 21.3	02.2	90 02.9	52.7	247 40.6	04.3	146 03.4	46.7	306 14.8	58	22 58.2	+ 64
3	13 54.3	182 21.4	·· 03.4	105 04.5	·· 52.7	262 42.5	·· 04.2	161 05.7	·· 46.8	320 39.6	57	·23 04.6	+ 62
4	28 56.7	197 21.6	04.7	120 06.2	52.6	277 44.4	04.1	176 08.0	46.8	335 04.3	56	23 10.8	+ 61
5	43 59.2	212 21.7	05.9	135 07.9	52.5	292 46.4	04.1	191 10.3	46.9	349 28.9	56	23 16.9	+ 59
6	59 01.6	227 21.8	− 6 07.1	150 09.5	−27 52.5	307 48.3	+22 04.0	206 12.6	−10 47.0	3 53.5	56	+23 22.8	+ 58
7	74 04.1	242 21.9	08.4	165 11.2	52.4	322 50.2	03.9	221 14.9	47.0	18 18.1	55	23 28.6	+ 56
8	89 06.6	257 22.1	09.6	180 12.8	52.3	337 52.1	03.8	236 17.2	47.1	32 42.6	55	23 34.2	+ 55
9	104 09.0	272 22.2	·· 10.8	195 14.5	·· 52.3	352 54.1	·· 03.8	251 19.5	·· 47.2	47 07.1	55	·23 39.7	+ 53
10	119 11.5	287 22.3	12.1	210 16.1	52.2	7 56.0	03.7	266 21.8	47.2	61 31.6	54	23 45.0	+ 52
11	134 14.0	302 22.4	13.3	225 17.8	52.1	22 57.9	03.6	281 24.1	47.3	75 56.0	54	23 50.2	+ 50
12	149 16.4	317 22.6	− 6 14.5	240 19.4	−27 52.1	37 59.9	+22 03.6	296 26.4	−10 47.4	90 20.4	54	+23 55.2	+ 48
13	164 18.9	332 22.7	15.7	255 21.1	52.0	53 01.8	03.5	311 28.7	47.4	104 44.8	53	24 00.0	+ 47
14	179 21.4	347 22.8	17.0	270 22.7	51.9	68 03.7	03.4	326 31.0	47.5	119 09.1	53	24 04.7	+ 45
15	194 23.8	2 22.9	·· 18.2	285 24.4	·· 51.9	83 05.7	·· 03.4	341 33.3	·· 47.6	133 33.4	53	·24 09.2	+ 44
16	209 26.3	17 23.0	19.4	300 26.0	51.8	98 07.6	03.3	356 35.6	47.6	147 57.7	53	24 13.6	+ 42
17	224 28.8	32 23.2	20.7	315 27.7	51.7	113 09.5	03.2	11 37.9	47.7	162 22.0	52	24 17.8	+ 40
18	239 31.2	47 23.3	− 6 21.9	330 29.3	−27 51.7	128 11.5	+22 03.2	26 40.2	−10 47.8	176 46.2	52	+24 21.8	+ 39
19	254 33.7	62 23.4	23.1	345 31.0	51.6	143 13.4	03.1	41 42.5	47.8	191 10.4	52	24 25.7	+ 37
20	269 36.1	77 23.5	24.3	0 32.6	51.5	158 15.3	03.0	56 44.8	47.9	205 34.6	52	24 29.4	+ 36
21	284 38.6	92 23.7	·· 25.6	15 34.2	·· 51.5	173 17.2	·· 03.0	71 47.1	·· 48.0	219 58.8	51	·24 33.0	+ 34
22	299 41.1	107 23.8	26.8	30 35.9	51.4	188 19.2	02.9	86 49.4	48.0	234 22.9	52	24 36.4	+ 32
23	314 43.5	122 23.9	28.0	45 37.5	51.3	203 21.1	02.8	101 51.7	48.1	248 47.1	51	24 39.6	+ 31
22 0	329 46.0	137 24.1	− 6 29.2	60 39.1	−27 51.3	218 23.0	+22 02.8	116 54.0	−10 48.2	263 11.2	51	+24 42.7	+ 29
1	344 48.5	152 24.2	30.5	75 40.8	51.2	233 25.0	02.7	131 56.3	48.2	277 35.3	52	24 45.6	+ 27
2	359 50.9	167 24.3	31.7	90 42.4	51.1	248 26.9	02.6	146 58.6	48.3	291 59.5	51	24 48.3	+ 26
3	14 53.4	182 24.4	·· 32.9	105 44.0	·· 51.1	263 28.8	·· 02.6	162 00.9	·· 48.4	306 23.6	51	·24 50.9	+ 24
4	29 55.9	197 24.6	34.2	120 45.7	51.0	278 30.8	02.5	177 03.2	48.4	320 47.7	51	24 53.3	+ 22
5	44 58.3	212 24.7	35.4	135 47.3	50.9	293 32.7	02.4	192 05.5	48.5	335 11.8	50	24 55.5	+ 21
6	60 00.8	227 24.8	− 6 36.6	150 48.9	−27 50.9	308 34.6	+22 02.4	207 07.8	−10 48.6	349 35.8	51	+24 57.6	+ 19
7	75 03.2	242 24.9	37.8	165 50.6	50.8	323 36.6	02.3	222 10.1	48.6	3 59.9	51	24 59.5	+ 18
8	90 05.7	257 25.1	39.1	180 52.2	50.7	338 38.5	02.2	237 12.4	48.7	18 24.0	51	25 01.3	+ 15
9	105 08.2	272 25.2	·· 40.3	195 53.8	·· 50.6	353 40.4	·· 02.2	252 14.7	·· 48.8	32 48.1	51	·25 02.8	+ 15
10	120 10.6	287 25.3	41.5	210 55.4	50.6	8 42.4	02.1	267 17.0	48.8	47 12.2	51	25 04.3	+ 12
11	135 13.1	302 25.5	42.7	225 57.1	50.5	23 44.3	02.0	282 19.3	48.9	61 36.3	51	25 05.5	+ 11
12	150 15.6	317 25.6	− 6 44.0	240 58.7	−27 50.4	38 46.2	+22 02.0	297 21.6	−10 49.0	76 00.4	51	+25 06.6	+ 9
13	165 18.0	332 25.7	45.2	256 00.3	50.4	53 48.2	01.9	312 23.9	49.0	90 24.5	52	25 07.5	+ 8
14	180 20.5	347 25.9	46.4	271 01.9	50.3	68 50.1	01.8	327 26.2	49.1	104 48.7	51	25 08.3	+ 6
15	195 23.0	2 26.0	·· 47.6	286 03.5	·· 50.2	83 52.0	·· 01.7	342 28.5	·· 49.2	119 12.8	52	·25 08.9	+ 4
16	210 25.4	17 26.1	48.8	301 05.2	50.2	98 54.0	01.7	357 30.8	49.2	133 37.0	51	25 09.3	+ 3
17	225 27.9	32 26.2	50.1	316 06.8	50.1	113 55.9	01.6	12 33.1	49.3	148 01.1	52	25 09.6	+ 1
18	240 30.4	47 26.4	− 6 51.3	331 08.4	−27 50.0	128 57.8	+22 01.5	27 35.4	−10 49.4	162 25.3	52	+25 09.7	− 1
19	255 32.8	62 26.5	52.5	346 10.0	50.0	143 59.8	01.5	42 37.7	49.5	176 49.5	53	25 09.6	− 2
20	270 35.3	77 26.6	53.7	1 11.6	49.9	159 01.7	01.4	57 40.0	49.5	191 13.8	52	25 09.4	− 4
21	285 37.7	92 26.8	·· 55.0	16 13.2	·· 49.8	174 03.7	·· 01.3	72 42.3	·· 49.6	205 38.0	53	·25 09.0	− 6
22	300 40.2	107 26.9	56.2	31 14.8	49.7	189 05.6	01.3	87 44.6	49.7	220 02.3	53	25 08.4	− 7
23	315 42.7	122 27.0	57.4	46 16.4	49.7	204 07.5	01.2	102 46.9	49.7	234 26.6	54	25 07.7	− 9
24	330 45.1	137 27.2	− 6 58.6	61 18.0	−27 49.6	219 09.5	+22 01.1	117 49.2	−10 49.8	248 51.0	53	+25 06.8	− 10
code	—	+ 1	− 12	+ 17	+ 1	+ 19	− 1	+ 23	0				

GMT		SUN GHA	SUN Dec.
h		° ′	° ′
20	0	179 07.1	+12 42.3
	1	194 07.3	41.5
	2	209 07.4	40.7
	3	224 07.6	•• 39.9
	4	239 07.7	39.0
	5	254 07.9	38.2
	6	269 08.0	+12 37.4
	7	284 08.2	36.6
	8	299 08.3	35.8
	9	314 08.5	•• 34.9
	10	329 08.6	34.1
	11	344 08.7	33.3
	12	359 08.9	+12 32.5
	13	14 09.0	31.7
	14	29 09.2	30.8
	15	44 09.3	•• 30.0
	16	59 09.5	29.2
	17	74 09.6	28.4
	18	89 09.8	+12 27.5
	19	104 09.9	26.7
	20	119 10.1	25.9
	21	134 10.2	•• 25.1
	22	149 10.4	24.2
	23	164 10.5	23.4
21	0	179 10.7	+12 22.6
	1	194 10.8	21.8
	2	209 11.0	20.9
	3	224 11.1	•• 20.1
	4	239 11.3	19.3
	5	254 11.4	18.5
	6	269 11.6	+12 17.6
	7	284 11.7	16.8
	8	299 11.9	16.0
	9	314 12.0	•• 15.1
	10	329 12.2	14.3
	11	344 12.3	13.5
	12	359 12.5	+12 12.6
	13	14 12.6	11.8
	14	29 12.8	11.0
	15	44 12.9	•• 10.2
	16	59 13.1	09.3
	17	74 13.2	08.5
	18	89 13.4	+12 07.7
	19	104 13.5	06.8
	20	119 13.7	06.0
	21	134 13.8	•• 05.2
	22	149 14.0	04.3
	23	164 14.2	03.5
22	0	179 14.3	+12 02.7
	1	194 14.5	01.8
	2	209 14.6	01.0
	3	224 14.8	•12 00.2
	4	239 14.9	11 59.3
	5	254 15.1	58.5
	6	269 15.2	+11 57.6
	7	284 15.4	56.8
	8	299 15.5	56.0
	9	314 15.7	•• 55.1
	10	329 15.9	54.3
	11	344 16.0	53.5
	12	359 16.2	+11 52.6
	13	14 16.3	51.8
	14	29 16.5	50.9
	15	44 16.6	•• 50.1
	16	59 16.8	49.3
	17	74 16.9	48.4
	18	89 17.1	+11 47.6
	19	104 17.3	46.7
	20	119 17.4	45.9
	21	134 17.6	•• 45.1
	22	149 17.7	44.2
	23	164 17.9	43.4
	24	179 18.1	+11 42.5
code		—	− 8

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.6	−40 28.7
5	Achernar	335 59.0	−57 27.6
30	Acrux	173 59.4	−62 51.1
19	Adhara	255 47.4	−28 54.3
10	Aldebaran	291 40.1	+16 25.3
32	Alioth	166 59.5	+56 12.5
34	Alkaid	153 33.7	+49 32.5
55	Al Na'ir	28 38.4	−47 10.7
15	Alnilam	276 31.2	− 1 13.6
25	Alphard	218 39.7	− 8 27.6
41	Alphecca	126 48.3	+26 52.1
1	Alpheratz	358 28.9	+28 50.5
51	Altair	62 50.9	+ 8 45.0
2	Ankaa	353 58.7	−42 32.8
42	Antares	113 20.3	−26 20.1
37	Arcturus	146 36.0	+19 25.2
43	Atria	109 01.6	−68 57.2
22	Avior	234 36.8	−59 21.7
13	Bellatrix	279 19.4	+ 6 18.8
16	Betelg'se	271 49.2	+ 7 24.1
17	Canopus	264 16.1	−52 39.9
12	Capella	281 39.8	+45 57.2
53	Deneb	50 01.1	+45 07.2
28	Denebola	183 18.8	+14 49.6
4	Diphda	349 39.8	−18 13.8
27	Dubhe	194 46.1	+61 59.8
14	Elnath	279 08.5	+28 34.3
47	Eltanin	91 06.3	+51 29.9
54	Enif	34 30.1	+ 9 40.2
56	Fomalhaut	16 12.1	−29 51.5
31	Gacrux	172 50.7	−56 51.8
29	Gienah	176 38.0	−17 17.5
35	Hadar	149 50.9	−60 09.6
6	Hamal	328 50.4	+23 15.0
48	Kaus Aust.	84 42.0	−34 24.6
40	Kochab	137 18.0	+74 20.7
57	Markab	14 21.9	+14 57.8
8	Menkar	315 01.1	+ 3 55.0
36	Menkent	148 59.8	−36 09.1
24	Miapl'dus	221 50.2	−69 31.8
9	Mirfak	309 43.5	+49 42.0
50	Nunki	76 52.6	−26 21.3
52	Peacock	54 27.9	−56 52.9
21	Pollux	244 21.8	+28 08.3
20	Procyon	245 46.1	+ 5 20.6
46	R'alhague	96 47.2	+12 35.6
26	Regulus	208 30.7	+12 11.4
11	Rigel	281 54.5	− 8 14.9
38	Rigil Kent.	140 52.4	−60 39.3
44	Sabik	103 03.0	−15 40.3
3	Schedar	350 30.6	+56 17.3
45	Shaula	97 21.6	−37 04.5
18	Sirius	259 12.8	−16 39.0
33	Spica	159 17.9	−10 55.6
23	Suhail	223 25.4	−43 14.9
49	Vega	81 08.5	+38 44.6
39	Zub'g'bi	137 54.3	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 20	Moonrise 21	Moonrise 22	Moonrise 23
°	h m	h m	h m	h m	h m	h m
N 72	2 59	////	□	□	□	□
70	3 23	////	□	□	□	□
68	3 42	////	17 44	□	□	□
66	3 56	////	18 58	□	□	□
64	4 08	////	19 35	19 45	20 24	21 53
62	4 19	////	20 02	20 25	21 13	22 31
60	4 27	////	20 23	20 53	21 44	22 58
58	4 35	1 17	20 40	21 14	22 07	23 19
56	4 41	1 50	20 54	21 32	22 26	23 36
54	4 47	2 14	21 07	21 47	22 42	23 51
52	4 53	2 32	21 18	22 00	22 56	24 04
50	4 58	2 47	21 28	22 12	23 08	24 15
45	5 08	3 15	21 48	22 36	23 33	24 38
40	5 17	3 36	22 05	22 55	23 53	24 57
35	5 24	3 52	22 20	23 11	24 09	0 09
30	5 30	4 05	22 32	23 25	24 24	0 24
20	5 41	4 25	22 54	23 49	24 48	0 48
10	5 51	4 39	23 12	24 10	0 10	1 09
0	6 00	4 50	23 30	24 29	0 29	1 29
10	6 09	4 58	23 47	24 48	0 48	1 49
20	6 18	5 05	24 06	0 06	1 09	2 10
30	6 28	5 09	24 28	0 28	1 34	2 34
35	6 34	5 10	24 41	0 41	1 48	2 48
40	6 41	5 11	24 56	0 56	2 04	3 05
45	6 48	5 11	25 14	1 14	2 24	3 25
50	6 58	5 11	0 16	1 36	2 49	3 50
52	7 02	5 10	0 25	1 47	3 01	4 02
54	7 07	5 10	0 34	1 59	3 15	4 16
56	7 12	5 09	0 45	2 13	3 31	4 32
58	7 17	5 07	0 57	2 29	3 50	4 51
S 60	7 24	5 06	1 11	2 49	4 14	5 15

Lat.	Sunset	Twlt. ends	Moonset 20	Moonset 21	Moonset 22	Moonset 23
°	h m	h m	h m	h m	h m	h m
N 72	21 02	////	□	□	□	□
70	20 39	////	□	□	□	□
68	20 22	////	16 33	□	□	□
66	20 08	////	15 19	□	□	□
64	19 56	////	14 43	16 36	18 03	18 37
62	19 46	////	14 17	15 57	17 14	17 59
60	19 37	////	13 57	15 29	16 43	17 31
58	19 30	22 42	13 40	15 08	16 19	17 10
56	19 24	22 11	13 27	14 50	16 00	16 53
54	19 18	21 48	13 14	14 36	15 45	16 38
52	19 12	21 30	13 04	14 23	15 31	16 25
50	19 08	21 16	12 54	14 11	15 19	16 13
45	18 57	20 48	12 34	13 48	14 54	15 50
40	18 49	20 28	12 18	13 29	14 34	15 30
35	18 42	20 13	12 05	13 13	14 17	15 14
30	18 35	20 00	11 53	13 00	14 03	15 01
20	18 25	19 41	11 33	12 37	13 39	14 37
10	18 15	19 27	11 16	12 17	13 17	14 16
0	18 06	19 16	10 59	11 58	12 58	13 57
10	17 58	19 09	10 43	11 39	12 38	13 38
20	17 49	19 03	10 26	11 19	12 17	13 17
30	17 39	18 59	10 06	10 56	11 52	12 53
35	17 33	18 58	9 55	10 43	11 38	12 39
40	17 27	18 58	9 42	10 27	11 21	12 22
45	17 19	18 57	9 26	10 09	11 01	12 02
50	17 10	18 58	9 07	9 46	10 36	11 38
52	17 06	18 59	8 58	9 35	10 24	11 26
54	17 01	19 00	8 48	9 22	10 10	11 12
56	16 56	19 01	8 37	9 08	9 54	10 56
58	16 50	19 02	8 24	8 51	9 35	10 37
S 60	16 44	19 05	8 09	8 31	9 11	10 14

G M T	Equation of Time (App.—Mean) 20	21	22
h	m s	m s	m s
0	− 3 31.7	− 3 17.6	− 3 03.1
6	− 3 28.2	− 3 14.0	− 2 59.4
12	− 3 24.7	− 3 10.4	− 2 55.6
18	− 3 21.2	− 3 06.8	− 2 51.9
24	− 3 17.6	− 3 03.1	− 2 48.1

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
20	4 46	14 51	20 01	9 31	16 17
21	5 44	14 51	19 58	9 28	16 14
22	6 43	14 50	19 55	9 25	16 10
23	7 43	14 50	19 53	9 22	16 06

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.1	0.2	0.3
30			
	0.1	0.1	0.2
45			
	0.1	0.1	0.2
60			
	0.1	0.1	0.1
75			
	0.1	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	20	21	22
°	′	′	′
0			
	18.6	18.2	17.7
4			
	18.6	18.2	17.7
8			
	18.6	18.2	17.7
12			
	18.5	18.2	17.7
16			
	18.5	18.1	17.6
20			
	18.4	18.1	17.6
24			
	18.4	18.0	17.5
28			
	18.3	17.9	17.5
32			
	18.2	17.9	17.4
36			
	18.1	17.8	17.4
40			
	18.0	17.7	17.3
44			
	17.9	17.6	17.2
48			
	17.7	17.5	17.1
52			
	17.6	17.4	17.0
56			
	17.5	17.2	16.9
60			
	17.3	17.1	16.8
64			
	17.2	17.0	16.7
68			
	17.0	16.8	16.6
72			
	16.9	16.7	16.5
76			
	16.7	16.6	16.4
80			
	16.5	16.4	16.3
84			
	16.4	16.3	16.1
88			
	16.2	16.2	16.0
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	20	21	22
°	′	′	′
0			
	13.8	14.0	14.3
4			
	13.8	14.0	14.3
8			
	13.8	14.1	14.3
12			
	13.9	14.1	14.4
16			
	13.9	14.1	14.4
20			
	14.0	14.2	14.4
24			
	14.0	14.2	14.5
28			
	14.1	14.3	14.5
32			
	14.2	14.4	14.6
36			
	14.3	14.5	14.7
40			
	14.4	14.6	14.8
44			
	14.5	14.7	14.8
48			
	14.7	14.8	14.9
52			
	14.8	14.9	15.0
56			
	14.9	15.0	15.1
60			
	15.1	15.1	15.2
64			
	15.2	15.3	15.3
68			
	15.4	15.4	15.4
72			
	15.5	15.5	15.5
76			
	15.7	15.7	15.7
80			
	15.9	15.8	15.8
84			
	16.0	16.0	15.9
88			
	16.2	16.1	16.0
90			

Subtract from table, back cover

Last Quarter 21

GMT	♈ GHA	VENUS −3.9 GHA	VENUS Dec.	MARS −1.2 GHA	MARS Dec.	JUPITER −1.5 GHA	JUPITER Dec.	SATURN 0.9 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
23 0	330 45.1	137 27.2	− 6 58.6	61 18.0	−27 49.6	219 09.5	+22 01.1	117 49.2	−10 49.8	248 51.0	53	+25 06.8	− 10
1	345 47.6	152 27.3	6 59.8	76 19.7	49.5	234 11.4	01.1	132 51.4	49.9	263 15.3	54	25 05.8	− 12
2	0 50.1	167 27.4	7 01.1	91 21.3	49.5	249 13.3	01.0	147 53.7	49.9	277 39.7	55	25 04.6	− 14
3	15 52.5	182 27.6	·· 02.3	106 22.9	·· 49.4	264 15.3	·· 00.9	162 56.0	·· 50.0	292 04.2	54	·25 03.2	− 15
4	30 55.0	197 27.7	03.5	121 24.5	49.3	279 17.2	00.9	177 58.3	50.1	306 28.6	55	25 01.7	− 17
5	45 57.5	212 27.8	04.7	136 26.1	49.2	294 19.1	00.8	193 00.6	50.1	320 53.1	56	25 00.0	− 18
6	60 59.9	227 28.0	− 7 05.9	151 27.7	−27 49.2	309 21.1	+22 00.7	208 02.9	−10 50.2	335 17.7	56	+24 58.2	− 20
7	76 02.4	242 28.1	07.2	166 29.3	49.1	324 23.0	00.7	223 05.2	50.3	349 42.3	56	24 56.2	− 22
8	91 04.9	257 28.2	08.4	181 30.9	49.0	339 24.9	00.6	238 07.5	50.3	4 06.9	57	24 54.0	− 23
9	106 07.3	272 28.4	·· 09.6	196 32.5	·· 49.0	354 26.9	·· 00.5	253 09.8	·· 50.4	18 31.6	57	·24 51.7	− 24
10	121 09.8	287 28.5	10.8	211 34.0	48.9	9 28.8	00.5	268 12.1	50.5	32 56.3	57	24 49.3	− 27
11	136 12.2	302 28.7	12.0	226 35.6	48.8	24 30.8	00.4	283 14.4	50.5	47 21.0	59	24 46.6	− 28
12	151 14.7	317 28.8	− 7 13.3	241 37.2	−27 48.8	39 32.7	+22 00.3	298 16.7	−10 50.6	61 45.9	58	+24 43.8	− 29
13	166 17.2	332 28.9	14.5	256 38.8	48.7	54 34.6	00.2	313 19.0	50.7	76 10.7	59	24 40.9	− 31
14	181 19.6	347 29.1	15.7	271 40.4	48.6	69 36.6	00.2	328 21.3	50.8	90 35.6	60	24 37.8	− 32
15	196 22.1	2 29.2	·· 16.9	286 42.0	·· 48.5	84 38.5	·· 00.1	343 23.6	·· 50.8	105 00.6	60	·24 34.6	− 34
16	211 24.6	17 29.3	18.1	301 43.6	48.5	99 40.4	00.0	358 25.9	50.9	119 25.6	61	24 31.2	− 36
17	226 27.0	32 29.5	19.4	316 45.2	48.4	114 42.4	22 00.0	13 28.2	51.0	133 50.7	61	24 27.6	− 37
18	241 29.5	47 29.6	− 7 20.6	331 46.8	−27 48.3	129 44.3	+21 59.9	28 30.5	−10 51.0	148 15.8	62	+24 23.9	− 38
19	256 32.0	62 29.8	21.8	346 48.4	48.2	144 46.3	59.8	43 32.8	51.1	162 41.0	63	24 20.1	− 40
20	271 34.4	77 29.9	23.0	1 49.9	48.2	159 48.2	59.8	58 35.0	51.2	177 06.3	63	24 16.1	− 42
21	286 36.9	92 30.0	·· 24.2	16 51.5	·· 48.1	174 50.1	·· 59.7	73 37.3	·· 51.2	191 31.6	63	·24 11.9	− 43
22	301 39.4	107 30.2	25.4	31 53.1	48.0	189 52.1	59.6	88 39.6	51.3	205 56.9	65	24 07.6	− 44
23	316 41.8	122 30.3	26.6	46 54.7	48.0	204 54.0	59.6	103 41.9	51.4	220 22.4	65	24 03.2	− 46
24 0	331 44.3	137 30.4	− 7 27.9	61 56.3	−27 47.9	219 55.9	+21 59.5	118 44.2	−10 51.4	234 47.9	65	+23 58.6	− 47
1	346 46.7	152 30.6	29.1	76 57.8	47.8	234 57.9	59.4	133 46.5	51.5	249 13.4	67	23 53.9	− 49
2	1 49.2	167 30.7	30.3	91 59.4	47.7	249 59.8	59.4	148 48.8	51.6	263 39.1	67	23 49.0	− 50
3	16 51.7	182 30.9	·· 31.5	107 01.0	·· 47.7	265 01.8	·· 59.3	163 51.1	·· 51.7	278 04.8	67	·23 44.0	− 52
4	31 54.1	197 31.0	32.7	122 02.6	47.6	280 03.7	59.2	178 53.4	51.7	292 30.5	69	23 38.8	− 53
5	46 56.6	212 31.1	33.9	137 04.1	47.5	295 05.6	59.2	193 55.7	51.8	306 56.4	69	23 33.5	− 54
6	61 59.1	227 31.3	− 7 35.2	152 05.7	−27 47.4	310 07.6	+21 59.1	208 58.0	−10 51.9	321 22.3	70	+23 28.1	− 56
7	77 01.5	242 31.4	36.4	167 07.3	47.4	325 09.5	59.0	224 00.3	51.9	335 48.3	70	23 22.5	− 57
8	92 04.0	257 31.6	37.6	182 08.8	47.3	340 11.5	58.9	239 02.6	52.0	350 14.3	71	23 16.8	− 58
9	107 06.5	272 31.7	·· 38.8	197 10.4	·· 47.2	355 13.4	·· 58.9	254 04.9	·· 52.1	4 40.4	73	·23 11.0	− 60
10	122 08.9	287 31.9	40.0	212 12.0	47.2	10 15.3	58.8	269 07.1	52.1	19 06.7	72	23 05.0	− 61
11	137 11.4	302 32.0	41.2	227 13.5	47.1	25 17.3	58.7	284 09.4	52.2	33 32.9	74	22 58.9	− 63
12	152 13.9	317 32.1	− 7 42.4	242 15.1	−27 47.0	40 19.2	+21 58.7	299 11.7	−10 52.3	47 59.3	74	+22 52.6	− 64
13	167 16.3	332 32.3	43.6	257 16.7	46.9	55 21.2	58.6	314 14.0	52.3	62 25.7	75	22 46.2	− 65
14	182 18.8	347 32.4	44.9	272 18.2	46.9	70 23.1	58.5	329 16.3	52.4	76 52.2	76	22 39.7	− 66
15	197 21.2	2 32.6	·· 46.1	287 19.8	·· 46.8	85 25.0	·· 58.5	344 18.6	·· 52.5	91 18.8	77	·22 33.1	− 68
16	212 23.7	17 32.7	47.3	302 21.4	46.7	100 27.0	58.4	359 20.9	52.6	105 45.5	77	22 26.3	− 69
17	227 26.2	32 32.9	48.5	317 22.9	46.6	115 28.9	58.3	14 23.2	52.6	120 12.2	79	22 19.4	− 70
18	242 28.6	47 33.0	− 7 49.7	332 24.5	−27 46.6	130 30.9	+21 58.3	29 25.5	−10 52.7	134 39.1	79	+22 12.4	− 72
19	257 31.1	62 33.1	50.9	347 26.0	46.5	145 32.8	58.2	44 27.8	52.8	149 06.0	80	22 05.2	− 72
20	272 33.6	77 33.3	52.1	2 27.6	46.4	160 34.7	58.1	59 30.1	52.8	163 33.0	80	21 58.0	− 74
21	287 36.0	92 33.4	·· 53.3	17 29.1	·· 46.3	175 36.7	·· 58.1	74 32.3	·· 52.9	178 00.0	82	·21 50.6	− 76
22	302 38.5	107 33.6	54.5	32 30.7	46.3	190 38.6	58.0	89 34.6	53.0	192 27.2	82	21 43.0	− 76
23	317 41.0	122 33.7	55.8	47 32.2	46.2	205 40.6	57.9	104 36.9	53.0	206 54.4	84	21 35.4	− 77
25 0	332 43.4	137 33.9	− 7 57.0	62 33.8	−27 46.1	220 42.5	+21 57.9	119 39.2	−10 53.1	221 21.8	84	+21 27.7	− 79
1	347 45.9	152 34.0	58.2	77 35.3	46.0	235 44.5	57.8	134 41.5	53.2	235 49.2	85	21 19.8	− 80
2	2 48.3	167 34.2	7 59.4	92 36.9	46.0	250 46.4	57.7	149 43.8	53.3	250 16.7	85	21 11.8	− 81
3	17 50.8	182 34.3	· 8 00.6	107 38.4	·· 45.9	265 48.3	·· 57.6	164 46.1	·· 53.3	264 44.2	87	·21 03.7	− 82
4	32 53.3	197 34.5	01.8	122 40.0	45.8	280 50.3	57.6	179 48.4	53.4	279 11.9	88	20 55.5	− 83
5	47 55.7	212 34.6	03.0	137 41.5	45.7	295 52.2	57.5	194 50.7	53.5	293 39.7	88	20 47.2	− 85
6	62 58.2	227 34.8	− 8 04.2	152 43.1	−27 45.6	310 54.2	+21 57.4	209 53.0	−10 53.5	308 07.5	89	+20 38.7	− 85
7	78 00.7	242 34.9	05.4	167 44.6	45.6	325 56.1	57.4	224 55.2	53.6	322 35.4	90	20 30.2	− 86
8	93 03.1	257 35.1	06.6	182 46.2	45.5	340 58.1	57.3	239 57.5	53.7	337 03.4	91	20 21.6	− 88
9	108 05.6	272 35.2	·· 07.8	197 47.7	·· 45.4	356 00.0	·· 57.2	254 59.8	·· 53.8	351 31.5	92	·20 12.8	− 89
10	123 08.1	287 35.4	09.0	212 49.2	45.3	11 01.9	57.2	270 02.1	53.8	5 59.7	93	20 03.9	− 89
11	138 10.5	302 35.5	10.2	227 50.8	45.3	26 03.9	57.1	285 04.4	53.9	20 28.0	93	19 55.0	− 91
12	153 13.0	317 35.7	− 8 11.4	242 52.3	−27 45.2	41 05.8	+21 57.0	300 06.7	−10 54.0	34 56.3	95	+19 45.9	− 92
13	168 15.5	332 35.8	12.7	257 53.9	45.1	56 07.8	57.0	315 09.0	54.0	49 24.8	95	19 36.7	− 92
14	183 17.9	347 35.9	13.9	272 55.4	45.0	71 09.7	56.9	330 11.3	54.1	63 53.3	96	19 27.5	− 94
15	198 20.4	2 36.1	·· 15.1	287 56.9	·· 45.0	86 11.7	·· 56.8	345 13.6	·· 54.2	78 21.9	97	·19 18.1	− 95
16	213 22.8	17 36.3	16.3	302 58.5	44.9	101 13.6	56.8	0 15.8	54.2	92 50.6	98	19 08.6	− 95
17	228 25.3	32 36.4	17.5	318 00.0	44.8	116 15.5	56.7	15 18.1	54.3	107 19.4	98	18 59.1	− 97
18	243 27.8	47 36.6	− 8 18.7	333 01.5	−27 44.7	131 17.5	+21 56.6	30 20.4	−10 54.4	121 48.2	100	+18 49.4	− 98
19	258 30.2	62 36.7	19.9	348 03.0	44.6	146 19.4	56.5	45 22.7	54.5	136 17.2	100	18 39.6	− 98
20	273 32.7	77 36.9	21.1	3 04.6	44.6	161 21.4	56.5	60 25.0	54.5	150 46.2	102	18 29.8	− 99
21	288 35.2	92 37.0	·· 22.3	18 06.1	·· 44.5	176 23.3	·· 56.4	75 27.3	·· 54.6	165 15.4	102	·18 19.9	−101
22	303 37.6	107 37.2	23.5	33 07.6	44.4	191 25.3	56.3	90 29.6	54.7	179 44.6	103	18 09.8	−101
23	318 40.1	122 37.3	24.7	48 09.2	44.3	206 27.2	56.3	105 31.9	54.7	194 13.9	104	17 59.7	−102
24	333 42.6	137 37.5	− 8 25.9	63 10.7	−27 44.3	221 29.2	+21 56.2	120 34.1	−10 54.8	208 43.3	105	+17 49.5	−103
code	—	+ 2	− 12	+ 16	+ 1	+ 20	− 1	+ 23	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
23 0	179 18.1	+11 42.5
1	194 18.2	41.7
2	209 18.4	40.8
3	224 18.5	·· 40.0
4	239 18.7	39.2
5	254 18.8	38.3
6	269 19.0	+11 37.5
7	284 19.2	36.6
8	299 19.3	35.8
9	314 19.5	·· 34.9
10	329 19.6	34.1
11	344 19.8	33.2
12	359 20.0	+11 32.4
13	14 20.1	31.6
14	29 20.3	30.7
15	44 20.4	·· 29.9
16	59 20.6	29.0
17	74 20.8	28.2
18	89 20.9	+11 27.3
19	104 21.1	26.5
20	119 21.3	25.6
21	134 21.4	·· 24.8
22	149 21.6	23.9
23	164 21.7	23.1
24 0	179 21.9	+11 22.2
1	194 22.1	21.4
2	209 22.2	20.5
3	224 22.4	·· 19.7
4	239 22.6	18.8
5	254 22.7	18.0
6	269 22.9	+11 17.1
7	284 23.1	16.3
8	299 23.2	15.4
9	314 23.4	·· 14.6
10	329 23.5	13.7
11	344 23.7	12.9
12	359 23.9	+11 12.0
13	14 24.0	11.1
14	29 24.2	10.3
15	44 24.4	·· 09.4
16	59 24.5	08.6
17	74 24.7	07.7
18	89 24.9	+11 06.9
19	104 25.0	06.0
20	119 25.2	05.2
21	134 25.4	·· 04.3
22	149 25.5	03.5
23	164 25.7	02.6
25 0	179 25.9	+11 01.7
1	194 26.0	00.9
2	209 26.2	11 00.0
3	224 26.4	·10 59.2
4	239 26.5	58.3
5	254 26.7	57.4
6	269 26.9	+10 56.6
7	284 27.0	55.7
8	299 27.2	54.9
9	314 27.4	·· 54.0
10	329 27.5	53.1
11	344 27.7	52.3
12	359 27.9	+10 51.4
13	14 28.1	50.6
14	29 28.2	49.7
15	44 28.4	·· 48.8
16	59 28.6	48.0
17	74 28.7	47.1
18	89 28.9	+10 46.3
19	104 29.1	45.4
20	119 29.2	44.5
21	134 29.4	·· 43.7
22	149 29.6	42.8
23	164 29.8	41.9
24	179 29.9	+10 41.1
code	—	− 9

No.	Name	STARS SHA	Dec.
		° ′	° ′
7	Acamar	315 51.6	−40 28.7
5	Achernar	335 59.0	−57 27.6
30	Acrux	173 59.4	−62 51.1
19	Adhara	255 47.4	−28 54.3
10	Aldebaran	291 40.0	+16 25.3
32	Alioth	166 59.5	+56 12.5
34	Alkaid	153 33.7	+49 32.5
55	Al Na'ir	28 38.4	−47 10.7
15	Alnilam	276 31.2	− 1 13.6
25	Alphard	218 39.7	− 8 27.6
41	Alphecca	126 48.3	+26 52.1
1	Alpheratz	358 28.9	+28 50.5
51	Altair	62 50.9	+ 8 45.0
2	Ankaa	353 58.7	−42 32.8
42	Antares	113 20.3	−26 20.1
37	Arcturus	146 36.0	+19 25.2
43	Atria	109 01.6	−68 57.2
22	Avior	234 36.7	−59 21.6
13	Bellatrix	279 19.4	+ 6 18.8
16	Betelg'se	271 49.1	+ 7 24.1
17	Canopus	264 16.0	−52 39.9
12	Capella	281 39.8	+45 57.2
53	Deneb	50 01.2	+45 07.3
28	Denebola	183 18.8	+14 49.6
4	Diphda	349 39.8	−18 13.8
27	Dubhe	194 46.1	+61 59.8
14	Elnath	279 08.5	+28 34.3
47	Eltanin	91 06.4	+51 29.9
54	Enif	34 30.1	+ 9 40.2
56	Fomalhaut	16 12.1	−29 51.5
31	Gacrux	172 50.7	−56 51.8
29	Gienah	176 38.0	−17 17.5
35	Hadar	149 50.9	−60 09.6
6	Hamal	328 50.4	+23 15.1
48	Kaus Aust.	84 42.0	−34 24.6
40	Kochab	137 18.0	+74 20.7
57	Markab	14 21.9	+14 57.9
8	Menkar	315 01.1	+ 3 55.0
36	Menkent	148 59.8	−36 09.1
24	Miapl'dus	221 50.2	−69 31.8
9	Mirfak	309 43.5	+49 42.0
50	Nunki	76 52.6	−26 21.3
52	Peacock	54 27.9	−56 52.9
21	Pollux	244 21.8	+28 08.3
20	Procyon	245 46.1	+ 5 20.6
46	R'alhague	96 47.2	+12 35.6
26	Regulus	208 30.7	+12 11.4
11	Rigel	281 54.5	− 8 14.9
38	Rigil Kent.	140 52.4	−60 39.3
44	Sabik	103 03.0	−15 40.3
3	Schedar	350 30.5	+56 17.4
45	Shaula	97 21.6	−37 04.5
18	Sirius	259 12.8	−16 38.9
33	Spica	159 17.9	−10 55.6
23	Suhail	223 25.4	−43 14.8
49	Vega	81 08.5	+38 44.7
39	Zub'g'bi	137 54.3	−15 51.3

Lat.	Sunrise	Twlt. begins	Moonrise 23	Moonrise 24	Moonrise 25	Moonrise 26
N °	h m	h m	h m	h m	h m	h m
72	3 17	////	□	□	□	□
70	3 37	////	□	□	□	0 00
68	3 54	////	□	21 56	24 40	0 40
66	4 07	////	□	23 05	25 07	1 07
64	4 17	////	21 53	23 41	25 28	1 28
62	4 27	////	22 31	24 06	0 06	1 44
60	4 34	0 49	22 58	24 26	0 26	1 58
58	4 41	1 36	23 19	24 42	0 42	2 10
56	4 47	2 03	23 36	24 56	0 56	2 20
54	4 53	2 24	23 51	25 08	1 08	2 29
52	4 58	2 40	24 04	0 04	1 19	2 37
50	5 02	2 54	24 15	0 15	1 28	2 44
45	5 12	3 20	24 38	0 38	1 48	2 59
40	5 19	3 41	24 57	0 57	2 04	3 12
35	5 26	3 56	0 09	1 12	2 17	3 22
30	5 32	4 08	0 24	1 26	2 29	3 32
20	5 42	4 26	0 48	1 49	2 49	3 48
10	5 51	4 39	1 09	2 08	3 06	4 01
0	5 59	4 49	1 29	2 27	3 22	4 14
10	6 07	4 57	1 49	2 46	3 39	4 27
20	6 15	5 02	2 10	3 05	3 56	4 41
30	6 25	5 06	2 34	3 28	4 15	4 56
35	6 30	5 07	2 48	3 42	4 27	5 05
40	6 36	5 07	3 05	3 57	4 40	5 16
45	6 43	5 07	3 25	4 15	4 55	5 28
50	6 52	5 06	3 50	4 38	5 14	5 42
52	6 56	5 05	4 02	4 49	5 23	5 49
54	7 00	5 03	4 16	5 01	5 33	5 56
56	7 05	5 02	4 32	5 15	5 44	6 05
58	7 10	5 01	4 51	5 32	5 57	6 14
S 60	7 16	4 59	5 15	5 51	6 12	6 25

Lat.	Sunset	Twlt. ends	Moonset 23	Moonset 24	Moonset 25	Moonset 26
N °	h m	h m	h m	h m	h m	h m
72	20 44	////	□	□	□	20 06
70	20 24	////	□	□	20 19	19 39
68	20 08	////	□	20 32	19 38	19 18
66	19 56	////	□	19 23	19 10	19 02
64	19 45	////	18 37	18 47	18 48	18 48
62	19 36	////	17 59	18 20	18 31	18 37
60	19 29	23 04	17 31	18 00	18 16	18 27
58	19 22	22 22	17 10	17 43	18 04	18 18
56	19 16	21 56	16 53	17 29	17 53	18 11
54	19 11	21 37	16 38	17 16	17 43	18 04
52	19 06	21 21	16 25	17 05	17 35	17 58
50	19 02	21 08	16 13	16 55	17 27	17 52
45	18 52	20 41	15 50	16 35	17 11	17 40
40	18 45	20 23	15 30	16 18	16 57	17 30
35	18 38	20 08	15 14	16 04	16 45	17 21
30	18 32	19 56	15 01	15 51	16 35	17 14
20	18 22	19 38	14 37	15 30	16 18	17 00
10	18 14	19 26	14 16	15 11	16 02	16 49
0	18 06	19 16	13 57	14 54	15 48	16 38
10	17 58	19 09	13 38	14 36	15 33	16 27
20	17 50	19 04	13 17	14 18	15 17	16 15
30	17 41	19 01	12 53	13 56	14 59	16 01
35	17 35	19 00	12 39	13 43	14 49	15 53
40	17 29	19 00	12 22	13 28	14 36	15 44
45	17 22	19 00	12 02	13 11	14 22	15 33
50	17 14	19 02	11 38	12 49	14 04	15 20
52	17 10	19 03	11 26	12 38	13 56	15 14
54	17 06	19 04	11 12	12 26	13 46	15 07
56	17 01	19 06	10 56	12 13	13 36	15 00
58	16 56	19 08	10 37	11 57	13 23	14 51
S 60	16 50	19 10	10 14	11 37	13 09	14 41

GMT	Equation of Time (App.—Mean) 23	24	25
h	m s	m s	m s
0	− 2 48.1	− 2 32.7	− 2 16.9
6	− 2 44.3	− 2 28.8	− 2 12.8
12	− 2 40.5	− 2 24.8	− 2 08.8
18	− 2 36.6	− 2 20.9	− 2 04.7
24	− 2 32.7	− 2 16.9	− 2 00.6

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
23	7 43	14 50	19 53	9 22	16 06
24	8 41	14 50	19 50	9 19	16 03
25	9 35	14 50	19 48	9 16	15 59
26	10 26	14 49	19 45	9 13	15 55

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.1	0.2	0.2
30	0.1	0.1	0.2
45	0.1	0.1	0.2
60	0.1	0.1	0.1
75	0.1	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	23	24	25
°	′	′	′
0	17.2	16.6	16.1
4	17.2	16.6	16.1
8	17.2	16.6	16.1
12	17.2	16.5	16.0
16	17.1	16.5	16.0
20	17.1	16.5	16.0
24	17.1	16.5	16.0
28	17.0	16.5	16.0
32	17.0	16.4	16.0
36	16.9	16.4	16.0
40	16.9	16.4	16.0
44	16.8	16.3	15.9
48	16.7	16.3	15.9
52	16.7	16.2	15.9
56	16.6	16.2	15.9
60	16.5	16.1	15.8
64	16.4	16.1	15.8
68	16.4	16.0	15.8
72	16.3	16.0	15.8
76	16.2	15.9	15.7
80	16.1	15.9	15.7
84	16.0	15.8	15.7
88	15.9	15.8	15.7
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	23	24	25
°	′	′	′
0	14.6	15.0	15.3
4	14.6	15.0	15.3
8	14.6	15.0	15.3
12	14.6	15.0	15.3
16	14.7	15.0	15.3
20	14.7	15.0	15.3
24	14.7	15.0	15.3
28	14.8	15.1	15.3
32	14.8	15.1	15.3
36	14.9	15.1	15.3
40	14.9	15.2	15.4
44	15.0	15.2	15.4
48	15.1	15.3	15.4
52	15.1	15.3	15.4
56	15.2	15.3	15.4
60	15.3	15.4	15.5
64	15.4	15.4	15.5
68	15.5	15.5	15.5
72	15.5	15.5	15.5
76	15.6	15.6	15.6
80	15.7	15.7	15.6
84	15.8	15.7	15.6
88	15.9	15.8	15.7
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −3.9 GHA	VENUS Dec.	MARS −1.1 GHA	MARS Dec.	JUPITER −1.5 GHA	JUPITER Dec.	SATURN 0.9 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
26 0	333 42.6	137 37.5	− 8 25.9	63 10.7	−27 44.3	221 29.2	+21 56.2	120 34.1	−10 54.8	208 43.3	105	+17 49.5	−103
1	348 45.0	152 37.6	27.1	78 12.2	44.2	236 31.1	56.1	135 36.4	54.9	223 12.8	105	17 39.2	−103
2	3 47.5	167 37.8	28.3	93 13.7	44.1	251 33.0	56.1	150 38.7	55.0	237 42.3	107	17 28.9	−105
3	18 50.0	182 37.9	•• 29.5	108 15.2	•• 44.0	266 35.0	•• 56.0	165 41.0	•• 55.0	252 12.0	107	·17 18.4	−105
4	33 52.4	197 38.1	30.7	123 16.8	43.9	281 36.9	55.9	180 43.3	55.1	266 41.7	108	17 07.9	−106
5	48 54.9	212 38.2	31.9	138 18.3	43.9	296 38.9	55.9	195 45.6	55.2	281 11.5	109	16 57.3	−107
6	63 57.3	227 38.4	− 8 33.1	153 19.8	−27 43.8	311 40.8	+21 55.8	210 47.9	−10 55.2	295 41.4	110	+16 46.6	−108
7	78 59.8	242 38.5	34.3	168 21.3	43.7	326 42.8	55.7	225 50.1	55.3	310 11.4	110	16 35.8	−108
8	94 02.3	257 38.7	35.5	183 22.8	43.6	341 44.7	55.7	240 52.4	55.4	324 41.4	112	16 25.0	−109
9	109 04.7	272 38.8	•• 36.7	198 24.3	•• 43.5	356 46.7	•• 55.6	255 54.7	•• 55.5	339 11.6	112	·16 14.1	−110
10	124 07.2	287 39.0	37.9	213 25.9	43.5	11 48.6	55.5	270 57.0	55.5	353 41.8	113	16 03.1	−111
11	139 09.7	302 39.2	39.1	228 27.4	43.4	26 50.6	55.4	285 59.3	55.6	8 12.1	114	15 52.0	−111
12	154 12.1	317 39.3	− 8 40.3	243 28.9	−27 43.3	41 52.5	+21 55.4	301 01.6	−10 55.7	22 42.5	114	+15 40.9	−112
13	169 14.6	332 39.5	41.5	258 30.4	43.2	56 54.5	55.3	316 03.9	55.7	37 12.9	116	15 29.7	−113
14	184 17.1	347 39.6	42.7	273 31.9	43.1	71 56.4	55.2	331 06.1	55.8	51 43.5	116	15 18.4	−114
15	199 19.5	2 39.8	•• 43.9	288 33.4	•• 43.1	86 58.3	•• 55.2	346 08.4	•• 55.9	66 14.1	117	·15 07.0	−114
16	214 22.0	17 39.9	45.1	303 34.9	43.0	102 00.3	55.1	1 10.7	56.0	80 44.8	118	14 55.6	−114
17	229 24.4	32 40.1	46.3	318 36.4	42.9	117 02.2	55.0	16 13.0	56.0	95 15.6	118	14 44.2	−116
18	244 26.9	47 40.3	− 8 47.5	333 37.9	−27 42.8	132 04.2	+21 55.0	31 15.3	−10 56.1	109 46.4	120	+14 32.6	−116
19	259 29.4	62 40.4	48.7	348 39.4	42.7	147 06.1	54.9	46 17.6	56.2	124 17.4	120	14 21.0	−116
20	274 31.8	77 40.6	49.9	3 40.9	42.7	162 08.1	54.8	61 19.8	56.2	138 48.4	121	14 09.4	−118
21	289 34.3	92 40.7	•• 51.1	18 42.4	•• 42.6	177 10.0	•• 54.8	76 22.1	•• 56.3	153 19.5	121	·13 57.6	−117
22	304 36.8	107 40.9	52.3	33 43.9	42.5	192 12.0	54.7	91 24.4	56.4	167 50.6	123	13 45.9	−119
23	319 39.2	122 41.0	53.5	48 45.4	42.4	207 13.9	54.6	106 26.7	56.5	182 21.9	123	13 34.0	−119
27 0	334 41.7	137 41.2	− 8 54.7	63 46.9	−27 42.3	222 15.9	+21 54.6	121 29.0	−10 56.5	196 53.2	124	+13 22.1	−119
1	349 44.2	152 41.4	55.9	78 48.4	42.3	237 17.8	54.5	136 31.3	56.6	211 24.6	124	13 10.2	−120
2	4 46.6	167 41.5	57.1	93 49.9	42.2	252 19.8	54.4	151 33.6	56.7	225 56.0	126	12 58.2	−120
3	19 49.1	182 41.7	•• 58.3	108 51.4	•• 42.1	267 21.7	•• 54.3	166 35.8	•• 56.7	240 27.6	126	·12 46.2	−121
4	34 51.6	197 41.8	8 59.5	123 52.9	42.0	282 23.7	54.3	181 38.1	56.8	254 59.2	126	12 34.1	−122
5	49 54.0	212 42.0	9 00.6	138 54.4	41.9	297 25.6	54.2	196 40.4	56.9	269 30.8	128	12 21.9	−122
6	64 56.5	227 42.2	− 9 01.8	153 55.9	−27 41.8	312 27.6	+21 54.1	211 42.7	−10 57.0	284 02.6	128	+12 09.7	−122
7	79 58.9	242 42.3	03.0	168 57.4	41.8	327 29.5	54.1	226 45.0	57.0	298 34.4	129	11 57.5	−123
8	95 01.4	257 42.5	04.2	183 58.8	41.7	342 31.5	54.0	241 47.3	57.1	313 06.3	129	11 45.2	−124
9	110 03.9	272 42.6	•• 05.4	199 00.3	•• 41.6	357 33.4	•• 53.9	256 49.5	•• 57.2	327 38.2	130	·11 32.8	−123
10	125 06.3	287 42.8	06.6	214 01.8	41.5	12 35.4	53.9	271 51.8	57.3	342 10.2	131	11 20.5	−125
11	140 08.8	302 43.0	07.8	229 03.3	41.4	27 37.3	53.8	286 54.1	57.3	356 42.3	131	11 08.0	−124
12	155 11.3	317 43.1	− 9 09.0	244 04.8	−27 41.3	42 39.3	+21 53.7	301 56.4	−10 57.4	11 14.4	132	+10 55.6	−125
13	170 13.7	332 43.3	10.2	259 06.3	41.3	57 41.2	53.7	316 58.7	57.5	25 46.6	133	10 43.1	−126
14	185 16.2	347 43.5	11.4	274 07.7	41.2	72 43.2	53.6	332 00.9	57.5	40 18.9	133	10 30.5	−126
15	200 18.7	2 43.6	•• 12.6	289 09.2	•• 41.1	87 45.1	•• 53.5	347 03.2	•• 57.6	54 51.2	134	·10 17.9	−126
16	215 21.1	17 43.8	13.8	304 10.7	41.0	102 47.1	53.4	2 05.5	57.7	69 23.6	135	10 05.3	−126
17	230 23.6	32 43.9	14.9	319 12.2	40.9	117 49.0	53.4	17 07.8	57.8	83 56.1	135	9 52.7	−127
18	245 26.1	47 44.1	− 9 16.1	334 13.7	−27 40.8	132 51.0	+21 53.3	32 10.1	−10 57.8	98 28.6	136	+ 9 40.0	−128
19	260 28.5	62 44.3	17.3	349 15.1	40.8	147 52.9	53.2	47 12.4	57.9	113 01.2	136	9 27.2	−127
20	275 31.0	77 44.4	18.5	4 16.6	40.7	162 54.9	53.2	62 14.6	58.0	127 33.8	137	9 14.5	−128
21	290 33.4	92 44.6	•• 19.7	19 18.1	•• 40.6	177 56.8	•• 53.1	77 16.9	•• 58.1	142 06.5	138	· 9 01.7	−128
22	305 35.9	107 44.8	20.9	34 19.6	40.5	192 58.8	53.0	92 19.2	58.1	156 39.3	138	8 48.9	−129
23	320 38.4	122 44.9	22.1	49 21.0	40.4	208 00.7	53.0	107 21.5	58.2	171 12.1	139	8 36.0	−128
28 0	335 40.8	137 45.1	− 9 23.3	64 22.5	−27 40.3	223 02.7	+21 52.9	122 23.8	−10 58.3	185 45.0	139	+ 8 23.2	−129
1	350 43.3	152 45.3	24.5	79 24.0	40.3	238 04.6	52.8	137 26.0	58.3	200 17.9	139	8 10.3	−130
2	5 45.8	167 45.4	25.6	94 25.4	40.2	253 06.6	52.8	152 28.3	58.4	214 50.8	141	7 57.3	−129
3	20 48.2	182 45.6	•• 26.8	109 26.9	•• 40.1	268 08.5	•• 52.7	167 30.6	•• 58.5	229 23.9	140	· 7 44.4	−130
4	35 50.7	197 45.8	28.0	124 28.4	40.0	283 10.5	52.6	182 32.9	58.6	243 56.9	142	7 31.4	−130
5	50 53.2	212 45.9	29.2	139 29.8	39.9	298 12.5	52.5	197 35.2	58.6	258 30.1	141	7 18.4	−130
6	65 55.6	227 46.1	− 9 30.4	154 31.3	−27 39.8	313 14.4	+21 52.5	212 37.4	−10 58.7	273 03.2	143	+ 7 05.4	−130
7	80 58.1	242 46.3	31.6	169 32.8	39.7	328 16.4	52.4	227 39.7	58.8	287 36.5	142	6 52.4	−131
8	96 00.5	257 46.4	32.8	184 34.2	39.7	343 18.3	52.3	242 42.0	58.9	302 09.7	144	6 39.3	−131
9	111 03.0	272 46.6	•• 33.9	199 35.7	•• 39.6	358 20.3	•• 52.3	257 44.3	•• 58.9	316 43.1	143	· 6 26.2	−131
10	126 05.5	287 46.8	35.1	214 37.2	39.5	13 22.2	52.2	272 46.6	59.0	331 16.4	144	6 13.1	−131
11	141 07.9	302 46.9	36.3	229 38.6	39.4	28 24.2	52.1	287 48.8	59.1	345 49.8	145	6 00.0	−131
12	156 10.4	317 47.1	− 9 37.5	244 40.1	−27 39.3	43 26.1	+21 52.1	302 51.1	−10 59.1	0 23.3	145	+ 5 46.9	−131
13	171 12.9	332 47.3	38.7	259 41.5	39.2	58 28.1	52.0	317 53.4	59.2	14 56.8	146	5 33.8	−132
14	186 15.3	347 47.4	39.9	274 43.0	39.1	73 30.0	51.9	332 55.7	59.3	29 30.4	146	5 20.6	−131
15	201 17.8	2 47.6	•• 41.0	289 44.4	•• 39.1	88 32.0	•• 51.9	347 58.0	•• 59.4	44 04.0	146	· 5 07.5	−132
16	216 20.3	17 47.8	42.2	304 45.9	39.0	103 33.9	51.8	3 00.2	59.4	58 37.6	147	4 54.3	−132
17	231 22.7	32 48.0	43.4	319 47.3	38.9	118 35.9	51.7	18 02.5	59.5	73 11.3	147	4 41.1	−132
18	246 25.2	47 48.1	− 9 44.6	334 48.8	−27 38.8	133 37.8	+21 51.7	33 04.8	−10 59.6	87 45.0	147	+ 4 27.9	−132
19	261 27.7	62 48.3	45.8	349 50.2	38.7	148 39.8	51.6	48 07.1	59.7	102 18.7	148	4 14.7	−132
20	276 30.1	77 48.5	47.0	4 51.7	38.6	163 41.8	51.5	63 09.4	59.7	116 52.5	148	4 01.5	−132
21	291 32.6	92 48.6	•• 48.1	19 53.1	•• 38.5	178 43.7	•• 51.4	78 11.6	•• 59.8	131 26.3	149	· 3 48.3	−133
22	306 35.0	107 48.8	49.3	34 54.6	38.4	193 45.7	51.4	93 13.9	10 59.9	146 00.2	149	3 35.0	−132
23	321 37.5	122 49.0	50.5	49 56.0	38.4	208 47.6	51.3	108 16.2	11 00.0	160 34.1	149	3 21.8	−132
24	336 40.0	137 49.2	− 9 51.7	64 57.5	−27 38.3	223 49.6	+21 51.2	123 18.5	−11 00.0	175 08.0	150	+ 3 08.6	−133
code	—	+ 2	− 12	+ 15	0	+ 19	0	+ 23	− 1				

GMT h	SUN GHA ° ′	SUN Dec. ° ′
26 0	179 29.9	+10 41.1
1	194 30.1	40.2
2	209 30.3	39.3
3	224 30.4	•• 38.5
4	239 30.6	37.6
5	254 30.8	36.7
6	269 31.0	+10 35.9
7	284 31.1	35.0
8	299 31.3	34.1
9	314 31.5	•• 33.3
10	329 31.6	32.4
11	344 31.8	31.5
12	359 32.0	+10 30.7
13	14 32.2	29.8
14	29 32.3	28.9
15	44 32.5	•• 28.1
16	59 32.7	27.2
17	74 32.9	26.3
18	89 33.0	+10 25.5
19	104 33.2	24.6
20	119 33.4	23.7
21	134 33.6	•• 22.8
22	149 33.7	22.0
23	164 33.9	21.1
27 0	179 34.1	+10 20.2
1	194 34.3	19.4
2	209 34.4	18.5
3	224 34.6	•• 17.6
4	239 34.8	16.7
5	254 35.0	15.9
6	269 35.1	+10 15.0
7	284 35.3	14.1
8	299 35.5	13.3
9	314 35.7	•• 12.4
10	329 35.8	11.5
11	344 36.0	10.6
12	359 36.2	+10 09.8
13	14 36.4	08.9
14	29 36.6	08.0
15	44 36.7	•• 07.1
16	59 36.9	06.2
17	74 37.1	05.4
18	89 37.3	+10 04.5
19	104 37.4	03.6
20	119 37.6	02.7
21	134 37.8	•• 01.9
22	149 38.0	01.0
23	164 38.2	10 00.1
28 0	179 38.3	+ 9 59.2
1	194 38.5	58.4
2	209 38.7	57.5
3	224 38.9	•• 56.6
4	239 39.1	55.7
5	254 39.2	54.8
6	269 39.4	+ 9 54.0
7	284 39.6	53.1
8	299 39.8	52.2
9	314 40.0	•• 51.3
10	329 40.1	50.4
11	344 40.3	49.6
12	359 40.5	+ 9 48.7
13	14 40.7	47.8
14	29 40.9	46.9
15	44 41.0	•• 46.0
16	59 41.2	45.1
17	74 41.4	44.3
18	89 41.6	+ 9 43.4
19	104 41.8	42.5
20	119 42.0	41.6
21	134 42.1	•• 40.7
22	149 42.3	39.8
23	164 42.5	39.0
24	179 42.7	+ 9 38.1
code	—	− 9

No.	Name	SHA ° ′	Dec. ° ′
7	Acamar	315 51.5	−40 28.7
5	Achernar	335 59.0	−57 27.6
30	Acrux	173 59.4	−62 51.1
19	Adhara	255 47.4	−28 54.3
10	Aldebaran	291 40.0	+16 25.3
32	Alioth	166 59.6	+56 12.5
34	Alkaid	153 33.7	+49 32.5
55	Al Na'ir	28 38.4	−47 10.7
15	Alnilam	276 31.2	− 1 13.6
25	Alphard	218 39.7	− 8 27.6
41	Alphecca	126 48.3	+26 52.1
1	Alpheratz	358 28.9	+28 50.6
51	Altair	62 50.9	+ 8 45.0
2	Ankaa	353 58.6	−42 32.8
42	Antares	113 20.3	−26 20.1
37	Arcturus	146 36.0	+19 25.2
43	Atria	109 01.7	−68 57.2
22	Avior	234 36.7	−59 21.6
13	Bellatrix	279 19.4	+ 6 18.8
16	Betelg'se	271 49.1	+ 7 24.1
17	Canopus	264 16.0	−52 39.9
12	Capella	281 39.7	+45 57.2
53	Deneb	50 01.2	+45 07.3
28	Denebola	183 18.8	+14 49.6
4	Diphda	349 39.8	−18 13.8
27	Dubhe	194 46.1	+61 59.8
14	Elnath	279 08.5	+28 34.3
47	Eltanin	91 06.4	+51 29.9
54	Enif	34 30.1	+ 9 40.2
56	Fomalhaut	16 12.1	−29 51.5
31	Gacrux	172 50.7	−56 51.8
29	Gienah	176 38.0	−17 17.5
35	Hadar	149 51.0	−60 09.6
6	Hamal	328 50.4	+23 15.1
48	Kaus Aust.	84 42.0	−34 24.6
40	Kochab	137 18.1	+74 20.7
57	Markab	14 21.9	+14 57.9
8	Menkar	315 01.0	+ 3 55.0
36	Menkent	148 59.8	−36 09.0
24	Miapl'dus	221 50.2	−69 31.8
9	Mirfak	309 43.5	+49 42.0
50	Nunki	76 52.6	−26 21.3
52	Peacock	54 27.9	−56 53.0
21	Pollux	244 21.8	+28 08.2
20	Procyon	245 46.1	+ 5 20.6
46	R'alhague	96 47.2	+12 35.6
26	Regulus	208 30.7	+12 11.4
11	Rigel	281 54.5	− 8 14.9
38	Rigil Kent.	140 52.4	−60 39.3
44	Sabik	103 03.0	−15 40.3
3	Schedar	350 30.5	+56 17.4
45	Shaula	97 21.6	−37 04.5
18	Sirius	259 12.7	−16 38.9
33	Spica	159 17.9	−10 55.6
23	Suhail	223 25.4	−43 14.8
49	Vega	81 08.6	+38 44.7
39	Zub'g'bl	137 54.4	−15 51.3

Lat. °	Sunrise h m	Twlt. begins h m	Moonrise 26 h m	Moonrise 27 h m	Moonrise 28 h m	Moonrise 29 h m
N 72	3 33	////	▭	1 58	4 11	6 09
70	3 51	////	0 00	2 23	4 22	6 12
68	4 05	////	0 40	2 42	4 31	6 14
66	4 17	////	1 07	2 57	4 39	6 16
64	4 26	////	1 28	3 09	4 45	6 17
62	4 35	////	1 44	3 20	4 51	6 18
60	4 42	1 17	1 58	3 28	4 55	6 19
58	4 48	1 52	2 10	3 36	4 59	6 20
56	4 53	2 15	2 20	3 43	5 03	6 21
54	4 58	2 33	2 29	3 49	5 06	6 22
52	5 03	2 49	2 37	3 54	5 09	6 22
50	5 07	3 01	2 44	3 59	5 12	6 23
45	5 15	3 26	2 59	4 10	5 18	6 24
40	5 22	3 44	3 12	4 18	5 23	6 25
35	5 28	3 59	3 22	4 26	5 27	6 26
30	5 34	4 10	3 32	4 32	5 31	6 27
20	5 43	4 27	3 48	4 44	5 37	6 29
10	5 51	4 40	4 01	4 53	5 43	6 30
0	5 58	4 49	4 14	5 03	5 48	6 31
10	6 06	4 55	4 27	5 12	5 53	6 32
20	6 13	5 00	4 41	5 21	5 59	6 34
30	6 22	5 03	4 56	5 32	6 05	6 35
35	6 27	5 03	5 05	5 39	6 09	6 36
40	6 32	5 03	5 16	5 46	6 13	6 37
45	6 39	5 02	5 28	5 54	6 17	6 38
50	6 46	5 00	5 42	6 04	6 23	6 40
52	6 50	4 58	5 49	6 09	6 25	6 40
54	6 53	4 57	5 56	6 14	6 28	6 41
56	6 58	4 56	6 05	6 20	6 31	6 42
58	7 02	4 53	6 14	6 26	6 35	6 43
S 60	7 08	4 50	6 25	6 33	6 39	6 44

Lat. °	Sunset h m	Twlt. ends h m	Moonset 26 h m	Moonset 27 h m	Moonset 28 h m	Moonset 29 h m
N 72	20 26	////	20 06	19 29	19 02	18 38
70	20 09	////	19 39	19 15	18 57	18 40
68	19 55	////	19 18	19 04	18 52	18 41
66	19 44	////	19 02	18 55	18 48	18 42
64	19 35	////	18 48	18 47	18 45	18 43
62	19 27	23 48	18 37	18 40	18 42	18 43
60	19 20	22 37	18 27	18 34	18 39	18 44
58	19 14	22 05	18 18	18 29	18 37	18 45
56	19 09	21 43	18 11	18 24	18 35	18 45
54	19 04	21 25	18 04	18 20	18 33	18 45
52	18 59	21 10	17 58	18 16	18 32	18 46
50	18 56	20 59	17 52	18 12	18 30	18 46
45	18 47	20 35	17 40	18 05	18 27	18 47
40	18 40	20 17	17 30	17 58	18 24	18 48
35	18 34	20 03	17 21	17 53	18 21	18 48
30	18 29	19 52	17 14	17 48	18 19	18 49
20	18 20	19 35	17 00	17 39	18 15	18 50
10	18 12	19 23	16 49	17 32	18 12	18 51
0	18 05	19 15	16 38	17 25	18 09	18 51
10	17 58	19 09	16 27	17 17	18 06	18 52
20	17 50	19 04	16 15	17 10	18 02	18 53
30	17 42	19 02	16 01	17 01	17 58	18 54
35	17 37	19 01	15 53	16 55	17 56	18 54
40	17 32	19 02	15 44	16 50	17 53	18 55
45	17 26	19 04	15 33	16 43	17 50	18 56
50	17 18	19 06	15 20	16 34	17 46	18 56
52	17 15	19 08	15 14	16 30	17 45	18 57
54	17 11	19 09	15 07	16 26	17 43	18 57
56	17 07	19 11	15 00	16 21	17 41	18 57
58	17 02	19 13	14 51	16 16	17 38	18 58
S 60	16 57	19 16	14 41	16 10	17 36	18 58

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0			
	0.2	0.2	0.2
30			
	0.2	0.2	0.2
45			
	0.2	0.1	0.2
60			
	0.2	0.1	0.1
75			
	0.2	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt. °	26 ′	27 ′	28 ′
0			
	15.4	14.7	14.0
4			
	15.4	14.7	14.0
8			
	15.4	14.7	14.0
12			
	15.4	14.7	14.1
16			
	15.4	14.7	14.1
20			
	15.4	14.7	14.1
24			
	15.4	14.7	14.1
28			
	15.4	14.8	14.2
32			
	15.4	14.8	14.2
36			
	15.4	14.8	14.3
40			
	15.4	14.8	14.3
44			
	15.5	14.9	14.4
48			
	15.5	14.9	14.5
52			
	15.5	14.9	14.5
56			
	15.5	15.0	14.6
60			
	15.5	15.0	14.7
64			
	15.5	15.1	14.7
68			
	15.5	15.1	14.8
72			
	15.5	15.2	14.9
76			
	15.5	15.2	15.0
80			
	15.5	15.3	15.1
84			
	15.5	15.3	15.1
88			
	15.5	15.3	15.2
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt. °	26 ′	27 ′	28 ′
0			
	15.6	16.1	16.4
4			
	15.6	16.1	16.4
8			
	15.6	16.0	16.4
12			
	15.6	16.0	16.4
16			
	15.6	16.0	16.4
20			
	15.6	16.0	16.3
24			
	15.6	16.0	16.3
28			
	15.6	16.0	16.3
32			
	15.6	15.9	16.2
36			
	15.6	15.9	16.2
40			
	15.6	15.9	16.1
44			
	15.6	15.8	16.1
48			
	15.6	15.8	16.0
52			
	15.6	15.8	15.9
56			
	15.6	15.7	15.9
60			
	15.6	15.7	15.8
64			
	15.6	15.6	15.7
68			
	15.6	15.6	15.6
72			
	15.6	15.6	15.6
76			
	15.5	15.5	15.5
80			
	15.5	15.5	15.4
84			
	15.5	15.4	15.3
88			
	15.5	15.4	15.2
90			

Subtract from table, back cover

Equation of Time (App.—Mean)

GMT h	26 m s	27 m s	28 m s
0	− 2 00.6	− 1 44.0	− 1 27.0
6	− 1 56.5	− 1 39.8	− 1 22.7
12	− 1 52.4	− 1 35.5	− 1 18.3
18	− 1 48.2	− 1 31.3	− 1 14.0
24	− 1 44.0	− 1 27.0	− 1 09.6

GMT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
26	10 26	14 49	19 45	9 13	15 55
27	11 14	14 49	19 43	9 10	15 52
28	11 58	14 49	19 41	9 07	15 48
29	12 41	14 49	19 38	9 04	15 44

New Moon 28

GMT		♈ GHA	VENUS −3.9 GHA	VENUS Dec.	MARS −1.1 GHA	MARS Dec.	JUPITER −1.5 GHA	JUPITER Dec.	SATURN 0.9 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
29	0	336 40.0	137 49.2	−9 51.7	64 57.5	−27 38.3	223 49.6	+21 51.2	123 18.5	−11 00.0	175 08.0	150	+ 3 08.6	−133
	1	351 42.4	152 49.3	52.9	79 58.9	38.2	238 51.5	51.2	138 20.7	00.1	189 42.0	150	2 55.3	−132
	2	6 44.9	167 49.5	54.0	95 00.4	38.1	253 53.5	51.1	153 23.0	00.2	204 16.0	150	2 42.1	−132
	3	21 47.4	182 49.7	·· 55.2	110 01.8	·· 38.0	268 55.4	·· 51.0	168 25.3	·· 00.3	218 50.0	151	· 2 28.9	−133
	4	36 49.8	197 49.9	56.4	125 03.2	37.9	283 57.4	51.0	183 27.6	00.3	233 24.1	150	2 15.6	−132
	5	51 52.3	212 50.0	57.6	140 04.7	37.8	298 59.4	50.9	198 29.9	00.4	247 58.1	152	2 02.4	−132
	6	66 54.8	227 50.2	−9 58.8	155 06.1	−27 37.7	314 01.3	+21 50.8	213 32.1	−11 00.5	262 32.3	151	+ 1 49.2	−133
	7	81 57.2	242 50.4	9 59.9	170 07.6	37.6	329 03.3	50.8	228 34.4	00.5	277 06.4	152	1 35.9	−132
	8	96 59.7	257 50.5	10 01.1	185 09.0	37.6	344 05.2	50.7	243 36.7	00.6	291 40.6	152	1 22.7	−132
	9	112 02.1	272 50.7	·· 02.3	200 10.4	·· 37.5	359 07.2	·· 50.6	258 39.0	·· 00.7	306 14.8	152	· 1 09.5	−132
	10	127 04.6	287 50.9	03.5	215 11.9	37.4	14 09.1	50.5	273 41.2	00.8	320 49.0	152	0 56.3	−132
	11	142 07.1	302 51.1	04.6	230 13.3	37.3	29 11.1	50.5	288 43.5	00.8	335 23.2	153	0 43.1	−132
	12	157 09.5	317 51.3	−10 05.8	245 14.7	−27 37.2	44 13.1	+21 50.4	303 45.8	−11 00.9	349 57.5	153	+ 0 29.9	−132
	13	172 12.0	332 51.4	07.0	260 16.2	37.1	59 15.0	50.3	318 48.1	01.0	4 31.8	153	0 16.7	−132
	14	187 14.5	347 51.6	08.2	275 17.6	37.0	74 17.0	50.3	333 50.3	01.1	19 06.1	153	+ 0 03.5	−132
	15	202 16.9	2 51.8	·· 09.3	290 19.0	·· 36.9	89 18.9	·· 50.2	348 52.6	·· 01.1	33 40.4	154	− 0 09.7	−132
	16	217 19.4	17 52.0	10.5	305 20.5	36.8	104 20.9	50.1	3 54.9	01.2	48 14.8	154	0 22.9	−131
	17	232 21.9	32 52.1	11.7	320 21.9	36.8	119 22.8	50.1	18 57.2	01.3	62 49.2	154	0 36.0	−132
	18	247 24.3	47 52.3	−10 12.9	335 23.3	−27 36.7	134 24.8	+21 50.0	33 59.4	−11 01.4	77 23.6	154	− 0 49.2	−131
	19	262 26.8	62 52.5	14.0	350 24.7	36.6	149 26.8	49.9	49 01.7	01.4	91 58.0	154	1 02.3	−131
	20	277 29.3	77 52.7	15.2	5 26.2	36.5	164 28.7	49.9	64 04.0	01.5	106 32.4	154	1 15.4	−131
	21	292 31.7	92 52.8	·· 16.4	20 27.6	·· 36.4	179 30.7	·· 49.8	79 06.3	·· 01.6	121 06.8	155	· 1 28.5	−131
	22	307 34.2	107 53.0	17.6	35 29.0	36.3	194 32.6	49.7	94 08.6	01.7	135 41.3	155	1 41.6	−131
	23	322 36.6	122 53.2	18.7	50 30.4	36.2	209 34.6	49.6	109 10.8	01.7	150 15.8	155	1 54.7	−130
30	0	337 39.1	137 53.4	−10 19.9	65 31.8	−27 36.1	224 36.6	+21 49.6	124 13.1	−11 01.8	164 50.3	154	− 2 07.7	−131
	1	352 41.6	152 53.6	21.1	80 33.3	36.0	239 38.5	49.5	139 15.4	01.9	179 24.7	155	2 20.8	−130
	2	7 44.0	167 53.7	22.2	95 34.7	35.9	254 40.5	49.4	154 17.7	02.0	193 59.2	156	2 33.8	−130
	3	22 46.5	182 53.9	·· 23.4	110 36.1	·· 35.8	269 42.4	·· 49.4	169 19.9	·· 02.0	208 33.8	155	· 2 46.8	−129
	4	37 49.0	197 54.1	24.6	125 37.5	35.8	284 44.4	49.3	184 22.2	02.1	223 08.3	155	2 59.7	−130
	5	52 51.4	212 54.3	25.8	140 38.9	35.7	299 46.4	49.2	199 24.5	02.2	237 42.8	156	3 12.7	−129
	6	67 53.9	227 54.5	−10 26.9	155 40.3	−27 35.6	314 48.3	+21 49.2	214 26.8	−11 02.3	252 17.4	155	− 3 25.6	−129
	7	82 56.4	242 54.7	28.1	170 41.8	35.5	329 50.3	49.1	229 29.0	02.3	266 51.9	156	3 38.5	−129
	8	97 58.8	257 54.8	29.3	185 43.2	35.4	344 52.2	49.0	244 31.3	02.4	281 26.5	155	3 51.4	−129
	9	113 01.3	272 55.0	·· 30.4	200 44.6	·· 35.3	359 54.2	·· 48.9	259 33.6	·· 02.5	296 01.0	156	· 4 04.3	−128
	10	128 03.8	287 55.2	31.6	215 46.0	35.2	14 56.2	48.9	274 35.8	02.6	310 35.6	155	4 17.1	−128
	11	143 06.2	302 55.4	32.8	230 47.4	35.1	29 58.1	48.8	289 38.1	02.6	325 10.1	156	4 29.9	−128
	12	158 08.7	317 55.6	−10 33.9	245 48.8	−27 35.0	45 00.1	+21 48.7	304 40.4	−11 02.7	339 44.7	156	− 4 42.7	−128
	13	173 11.1	332 55.7	35.1	260 50.2	34.9	60 02.0	48.7	319 42.7	02.8	354 19.3	156	4 55.5	−127
	14	188 13.6	347 55.9	36.3	275 51.6	34.8	75 04.0	48.6	334 44.9	02.9	8 53.9	155	5 08.2	−127
	15	203 16.1	2 56.1	·· 37.4	290 53.0	·· 34.7	90 06.0	·· 48.5	349 47.2	·· 02.9	23 28.4	156	· 5 20.9	−127
	16	218 18.5	17 56.3	38.6	305 54.4	34.6	105 07.9	48.5	4 49.5	03.0	38 03.0	156	5 33.6	−126
	17	233 21.0	32 56.5	39.8	320 55.8	34.5	120 09.9	48.4	19 51.8	03.1	52 37.6	155	5 46.2	−126
	18	248 23.5	47 56.7	−10 40.9	335 57.2	−27 34.4	135 11.8	+21 48.3	34 54.0	−11 03.2	67 12.1	156	− 5 58.8	−126
	19	263 25.9	62 56.9	42.1	350 58.6	34.4	150 13.8	48.3	49 56.3	03.2	81 46.7	156	6 11.4	−125
	20	278 28.4	77 57.0	43.3	6 00.0	34.3	165 15.8	48.2	64 58.6	03.3	96 21.3	155	6 23.9	−125
	21	293 30.9	92 57.2	·· 44.4	21 01.4	·· 34.2	180 17.7	·· 48.1	80 00.9	·· 03.4	110 55.8	156	· 6 36.4	−125
	22	308 33.3	107 57.4	45.6	36 02.8	34.1	195 19.7	48.0	95 03.1	03.5	125 30.4	155	6 48.9	−124
	23	323 35.8	122 57.6	46.7	51 04.2	34.0	210 21.7	48.0	110 05.4	03.5	140 04.9	155	7 01.3	−124
31	0	338 38.2	137 57.8	−10 47.9	66 05.6	−27 33.9	225 23.6	+21 47.9	125 07.7	−11 03.6	154 39.4	156	− 7 13.7	−124
	1	353 40.7	152 58.0	49.1	81 07.0	33.8	240 25.6	47.8	140 09.9	03.7	169 14.0	155	7 26.1	−123
	2	8 43.2	167 58.2	50.2	96 08.4	33.7	255 27.5	47.8	155 12.2	03.8	183 48.5	155	7 38.4	−123
	3	23 45.6	182 58.3	·· 51.4	111 09.8	·· 33.6	270 29.5	·· 47.7	170 14.5	·· 03.8	198 23.0	155	· 7 50.7	−123
	4	38 48.1	197 58.5	52.6	126 11.2	33.5	285 31.5	47.6	185 16.8	03.9	212 57.5	155	8 03.0	−122
	5	53 50.6	212 58.7	53.7	141 12.6	33.4	300 33.4	47.6	200 19.0	04.0	227 32.0	154	8 15.2	−122
	6	68 53.0	227 58.9	−10 54.9	156 14.0	−27 33.3	315 35.4	+21 47.5	215 21.3	−11 04.1	242 06.4	155	− 8 27.4	−121
	7	83 55.5	242 59.1	56.0	171 15.4	33.2	330 37.4	47.4	230 23.6	04.1	256 40.9	155	8 39.5	−121
	8	98 58.0	257 59.3	57.2	186 16.7	33.1	345 39.3	47.4	245 25.8	04.2	271 15.4	154	8 51.6	−120
	9	114 00.4	272 59.5	·· 58.4	201 18.1	·· 33.0	0 41.3	·· 47.3	260 28.1	·· 04.3	285 49.8	154	· 9 03.6	−120
	10	129 02.9	287 59.7	10 59.5	216 19.5	32.9	15 43.3	47.2	275 30.4	04.4	300 24.2	154	9 15.6	−120
	11	144 05.4	302 59.9	11 00.7	231 20.9	32.8	30 45.2	47.1	290 32.7	04.4	314 58.6	154	9 27.6	−119
	12	159 07.8	318 00.0	−11 01.8	246 22.3	−27 32.7	45 47.2	+21 47.1	305 34.9	−11 04.5	329 33.0	154	− 9 39.5	−119
	13	174 10.3	333 00.2	03.0	261 23.7	32.6	60 49.2	47.0	320 37.2	04.6	344 07.4	153	9 51.4	−118
	14	189 12.7	348 00.4	04.1	276 25.0	32.5	75 51.1	46.9	335 39.5	04.7	358 41.7	153	10 03.2	−118
	15	204 15.2	3 00.6	·· 05.3	291 26.4	·· 32.4	90 53.1	·· 46.9	350 41.7	·· 04.7	13 16.0	154	·10 15.0	−117
	16	219 17.7	18 00.8	06.5	306 27.8	32.3	105 55.0	46.8	5 44.0	04.8	27 50.4	152	10 26.7	−117
	17	234 20.1	33 01.0	07.6	321 29.2	32.2	120 57.0	46.7	20 46.3	04.9	42 24.6	153	10 38.4	−117
	18	249 22.6	48 01.2	−11 08.8	336 30.6	−27 32.1	135 59.0	+21 46.7	35 48.5	−11 05.0	56 58.9	153	−10 50.1	−116
	19	264 25.1	63 01.4	09.9	351 31.9	32.0	151 00.9	46.6	50 50.8	05.0	71 33.2	152	11 01.7	−115
	20	279 27.5	78 01.6	11.1	6 33.3	31.9	166 02.9	46.5	65 53.1	05.1	86 07.4	152	11 13.2	−115
	21	294 30.0	93 01.8	·· 12.2	21 34.7	·· 31.8	181 04.9	·· 46.5	80 55.4	·· 05.2	100 41.6	152	·11 24.7	−114
	22	309 32.5	108 02.0	13.4	36 36.1	31.8	196 06.8	46.4	95 57.6	05.3	115 15.8	151	11 36.1	−114
	23	324 34.9	123 02.2	14.5	51 37.4	31.7	211 08.8	46.3	110 59.9	05.3	129 49.9	152	11 47.5	−114
	24	339 37.4	138 02.4	−11 15.7	66 38.8	−27 31.6	226 10.8	+21 46.2	126 02.2	−11 05.4	144 24.1	151	−11 58.9	−112
code		—	+ 1	− 12	+ 14	+ 1	+ 19	0	+ 23	− 1				

Day	GMT h	SUN GHA ° ′	SUN Dec. ° ′
29	0	179 42.7	+ 9 38.1
	1	194 42.9	37.2
	2	209 43.1	36.3
	3	224 43.2 ··	35.4
	4	239 43.4	34.5
	5	254 43.6	33.6
	6	269 43.8	+ 9 32.8
	7	284 44.0	31.9
	8	299 44.2	31.0
	9	314 44.3 ··	30.1
	10	329 44.5	29.2
	11	344 44.7	28.3
	12	359 44.9	+ 9 27.4
	13	14 45.1	26.5
	14	29 45.3	25.7
	15	44 45.5 ··	24.8
	16	59 45.6	23.9
	17	74 45.8	23.0
	18	89 46.0	+ 9 22.1
	19	104 46.2	21.2
	20	119 46.4	20.3
	21	134 46.6 ··	19.4
	22	149 46.8	18.5
	23	164 46.9	17.7
30	0	179 47.1	+ 9 16.8
	1	194 47.3	15.9
	2	209 47.5	15.0
	3	224 47.7 ··	14.1
	4	239 47.9	13.2
	5	254 48.1	12.3
	6	269 48.3	+ 9 11.4
	7	284 48.4	10.5
	8	299 48.6	09.6
	9	314 48.8 ··	08.7
	10	329 49.0	07.8
	11	344 49.2	06.9
	12	359 49.4	+ 9 06.0
	13	14 49.6	05.2
	14	29 49.8	04.3
	15	44 49.9 ··	03.4
	16	59 50.1	02.5
	17	74 50.3	01.6
	18	89 50.5	+ 9 00.7
	19	104 50.7	8 59.8
	20	119 50.9	58.9
	21	134 51.1 ··	58.0
	22	149 51.3	57.1
	23	164 51.5	56.2
31	0	179 51.7	+ 8 55.3
	1	194 51.8	54.4
	2	209 52.0	53.5
	3	224 52.2 ··	52.6
	4	239 52.4	51.7
	5	254 52.6	50.8
	6	269 52.8	+ 8 49.9
	7	284 53.0	49.0
	8	299 53.2	48.1
	9	314 53.4 ··	47.2
	10	329 53.6	46.3
	11	344 53.8	45.4
	12	359 54.0	+ 8 44.5
	13	14 54.1	43.6
	14	29 54.3	42.7
	15	44 54.5 ··	41.8
	16	59 54.7	40.9
	17	74 54.9	40.0
	18	89 55.1	+ 8 39.1
	19	104 55.3	38.2
	20	119 55.5	37.3
	21	134 55.7 ··	36.4
	22	149 55.9	35.5
	23	164 56.1	34.6
	24	179 56.3	+ 8 33.7
	code	—	− 8

No.	Name	SHA ° ′	Dec. ° ′
7	Acamar	315 51.5	−40 28.7
5	Achernar	335 58.9	−57 27.6
30	Acrux	173 59.4	−62 51.1
19	Adhara	255 47.4	−28 54.3
10	Aldebaran	291 40.0	+16 25.3
32	Alioth	166 59.6	+56 12.5
34	Alkaid	153 33.7	+49 32.5
55	Al Na'ir	28 38.4	−47 10.7
15	Alnilam	276 31.2	− 1 13.6
25	Alphard	218 39.7	− 8 27.6
41	Alphecca	126 48.3	+26 52.1
1	Alpheratz	358 28.8	+28 50.6
51	Altair	62 50.9	+ 8 45.0
2	Ankaa	353 58.6	−42 32.8
42	Antares	113 20.3	−26 20.1
37	Arcturus	146 36.0	+19 25.2
43	Atria	109 01.7	−68 57.2
22	Avior	234 36.7	−59 21.6
13	Bellatrix	279 19.3	+ 6 18.8
16	Betelg'se	271 49.1	+ 7 24.1
17	Canopus	264 16.0	−52 39.9
12	Capella	281 39.7	+45 57.2
53	Deneb	50 01.2	+45 07.3
28	Denebola	183 18.8	+14 49.6
4	Diphda	349 39.7	−18 13.8
27	Dubhe	194 46.1	+61 59.8
14	Elnath	279 08.4	+28 34.3
47	Eltanin	91 06.4	+51 29.9
54	Enif	34 30.1	+ 9 40.2
56	Fomalhaut	16 12.1	−29 51.5
31	Gacrux	172 50.7	−56 51.8
29	Gienah	176 38.0	−17 17.5
35	Hadar	149 51.0	−60 09.6
6	Hamal	328 50.4	+23 15.1
48	Kaus Aust.	84 42.0	−34 24.6
40	Kochab	137 18.2	+74 20.7
57	Markab	14 21.9	+14 57.9
8	Menkar	315 01.0	+ 3 55.0
36	Menkent	148 59.9	−36 09.0
24	Miapl'dus	221 50.2	−69 31.7
9	Mirfak	309 43.4	+49 42.0
50	Nunki	76 52.6	−26 21.3
52	Peacock	54 27.9	−56 53.0
21	Pollux	244 21.8	+28 08.2
20	Procyon	245 46.0	+ 5 20.6
46	R'alhague	96 47.2	+12 35.6
26	Regulus	208 30.7	+12 11.4
11	Rigel	281 54.5	− 8 14.9
38	Rigil Kent.	140 52.4	−60 39.3
44	Sabik	103 03.0	−15 40.3
3	Schedar	350 30.5	+56 17.4
45	Shaula	97 21.6	−37 04.5
18	Sirius	259 12.7	−16 38.9
33	Spica	159 17.9	−10 55.6
23	Suhail	223 25.4	−43 14.8
49	Vega	81 08.6	+38 44.7
39	Zub'g'bi	137 54.4	−15 51.3

Lat. °	Sunrise h m	Twlt. begins h m	Moonrise 29 h m	Moonrise 30 h m	Moonrise 31 h m	Moonrise 1 h m
N 72	3 49	////	6 09	8 04	10 00	12 10
70	4 04	////	6 12	7 58	9 45	11 39
68	4 17	////	6 14	7 53	9 33	11 16
66	4 27	////	6 16	7 49	9 23	10 59
64	4 35	////	6 17	7 46	9 15	10 45
62	4 42	0 52	6 18	7 43	9 08	10 33
60	4 49	1 38	6 19	7 41	9 02	10 23
58	4 54	2 06	6 20	7 39	8 56	10 14
56	4 59	2 26	6 21	7 37	8 52	10 06
54	5 04	2 43	6 22	7 35	8 48	10 00
52	5 07	2 57	6 22	7 33	8 44	9 54
50	5 11	3 08	6 23	7 32	8 40	9 48
45	5 19	3 31	6 24	7 29	8 33	9 36
40	5 25	3 48	6 25	7 26	8 27	9 27
35	5 31	4 01	6 26	7 24	8 21	9 18
30	5 35	4 12	6 27	7 22	8 17	9 11
20	5 44	4 28	6 29	7 19	8 09	8 59
10	5 51	4 40	6 30	7 16	8 02	8 48
0	5 57	4 48	6 31	7 13	7 55	8 38
10	6 04	4 54	6 32	7 11	7 49	8 28
20	6 11	4 58	6 34	7 08	7 42	8 17
30	6 18	4 59	6 35	7 05	7 34	8 05
35	6 23	5 00	6 36	7 03	7 30	7 58
40	6 27	4 59	6 37	7 01	7 25	7 50
45	6 33	4 57	6 38	6 59	7 19	7 41
50	6 40	4 54	6 40	6 56	7 12	7 30
52	6 43	4 52	6 40	6 54	7 09	7 25
54	6 46	4 51	6 41	6 53	7 06	7 20
56	6 50	4 48	6 42	6 52	7 02	7 14
58	6 54	4 46	6 43	6 50	6 58	7 07
60 S	6 58	4 43	6 44	6 48	6 53	6 59

Lat. °	Sunset h m	Twlt. ends h m	Moonset 29 h m	Moonset 30 h m	Moonset 31 h m	Moonset 1 h m
N 72	20 09	////	18 38	18 15	17 46	17 06
70	19 54	////	18 40	18 23	18 04	17 39
68	19 42	////	18 41	18 30	18 18	18 03
66	19 32	////	18 42	18 36	18 29	18 22
64	19 24	////	18 43	18 41	18 39	18 37
62	19 17	22 57	18 43	18 45	18 47	18 50
60	19 11	22 16	18 44	18 49	18 54	19 01
58	19 06	21 50	18 45	18 52	19 00	19 10
56	19 01	21 30	18 45	18 55	19 06	19 19
54	18 57	21 15	18 45	18 58	19 11	19 26
52	18 53	21 02	18 46	19 00	19 16	19 33
50	18 49	20 50	18 46	19 03	19 20	19 39
45	18 42	20 28	18 47	19 08	19 29	19 52
40	18 35	20 11	18 48	19 12	19 36	20 03
35	18 30	19 58	18 48	19 15	19 43	20 12
30	18 25	19 48	18 49	19 19	19 48	20 20
20	18 17	19 32	18 50	19 24	19 58	20 34
10	18 10	19 21	18 51	19 29	20 07	20 47
0	18 04	19 14	18 51	19 33	20 16	20 59
10	17 58	19 08	18 52	19 38	20 24	21 10
20	17 51	19 05	18 53	19 43	20 33	21 23
30	17 44	19 04	18 54	19 49	20 43	21 37
35	17 40	19 04	18 54	19 52	20 49	21 46
40	17 35	19 05	18 55	19 56	20 56	21 55
45	17 29	19 07	18 56	20 00	21 03	22 07
50	17 23	19 11	18 56	20 05	21 13	22 20
52	17 20	19 12	18 57	20 07	21 17	22 27
54	17 16	19 14	18 57	20 10	21 22	22 34
56	17 13	19 17	18 57	20 13	21 28	22 42
58	17 09	19 20	18 58	20 16	21 34	22 51
60 S	17 04	19 23	18 58	20 20	21 40	23 01

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0	0.2	0.2	0.2
30	0.2	0.2	0.2
45	0.2	0.1	0.1
60	0.2	0.1	0.1
75	0.2	0.0	0.0
90			

Moon's Lower Limb Add

Alt. °	29 ′	30 ′	31 ′
0	13.5	12.9	12.4
4	13.5	12.9	12.4
8	13.5	12.9	12.4
12	13.6	12.9	12.4
16	13.6	13.0	12.5
20	13.6	13.0	12.6
24	13.7	13.1	12.6
28	13.7	13.2	12.7
32	13.8	13.2	12.8
36	13.9	13.3	12.9
40	13.9	13.4	13.0
44	14.0	13.5	13.1
48	14.1	13.6	13.3
52	14.2	13.7	13.4
56	14.3	13.9	13.5
60	14.4	14.0	13.7
64	14.5	14.1	13.9
68	14.6	14.3	14.0
72	14.7	14.4	14.2
76	14.8	14.5	14.4
80	14.9	14.7	14.5
84	15.0	14.8	14.7
88	15.1	14.9	14.8
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt. °	29 ′	30 ′	31 ′
0	16.7	17.1	17.4
4	16.7	17.1	17.4
8	16.7	17.0	17.3
12	16.7	17.0	17.3
16	16.6	17.0	17.2
20	16.6	16.9	17.2
24	16.6	16.9	17.1
28	16.5	16.8	17.0
32	16.4	16.7	16.9
36	16.4	16.6	16.8
40	16.3	16.5	16.7
44	16.2	16.4	16.6
48	16.1	16.3	16.5
52	16.1	16.2	16.3
56	16.0	16.1	16.2
60	15.9	16.0	16.0
64	15.8	15.8	15.9
68	15.7	15.7	15.7
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.3	15.3	15.2
84	15.2	15.1	15.0
88	15.1	15.0	14.9
90			

Subtract from table, back cover

Equation of Time (App.—Mean)

GMT h	29 m s	30 m s	31 m s
0	− 1 09.6	− 0 51.9	− 0 33.8
6	− 1 05.2	− 0 47.4	− 0 29.2
12	− 1 00.8	− 0 42.8	− 0 24.6
18	− 0 56.3	− 0 38.3	− 0 20.0
24	− 0 51.9	− 0 33.8	− 0 15.3

GMT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
29	12 41	14 49	19 38	9 04	15 44
30	13 23	14 48	19 36	9 00	15 41
31	14 05	14 48	19 34	8 57	15 37
1	14 48	14 48	19 32	8 54	15 34

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GMT		♈	VENUS −4.0		MARS −1.0		JUPITER −1.5		SATURN 0.9		MOON			
	h	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
		° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
1	0	339 37.4	138 02.4	−11 15.7	66 38.8	−27 31.6	226 10.8	+21 46.2	126 02.2	−11 05.4	144 24.1	151	−11 58.9	−112
	1	354 39.8	153 02.5	16.9	81 40.2	31.5	241 12.7	46.2	141 04.4	05.5	158 58.2	150	12 10.1	−113
	2	9 42.3	168 02.7	18.0	96 41.5	31.4	256 14.7	46.1	156 06.7	05.6	173 32.2	151	12 21.4	−111
	3	24 44.8	183 02.9	·· 19.2	111 42.9	·· 31.3	271 16.7	·· 46.0	171 09.0	·· 05.7	188 06.3	150	·12 32.5	−111
	4	39 47.2	198 03.1	20.3	126 44.3	31.2	286 18.6	46.0	186 11.2	05.7	202 40.3	150	12 43.6	−111
	5	54 49.7	213 03.3	21.5	141 45.6	31.1	301 20.6	45.9	201 13.5	05.8	217 14.3	150	12 54.7	−110
	6	69 52.2	228 03.5	−11 22.6	156 47.0	−27 31.0	316 22.6	+21 45.8	216 15.8	−11 05.9	231 48.3	149	−13 05.7	−110
	7	84 54.6	243 03.7	23.8	171 48.4	30.9	331 24.5	45.8	231 18.0	06.0	246 22.2	149	13 16.7	−108
	8	99 57.1	258 03.9	24.9	186 49.7	30.8	346 26.5	45.7	246 20.3	06.0	260 56.1	149	13 27.5	−109
	9	114 59.6	273 04.1	·· 26.1	201 51.1	·· 30.7	1 28.5	·· 45.6	261 22.6	·· 06.1	275 30.0	148	·13 38.4	−107
	10	130 02.0	288 04.3	27.2	216 52.5	30.6	16 30.5	45.6	276 24.9	06.2	290 03.8	148	13 49.1	−108
	11	145 04.5	303 04.5	28.4	231 53.8	30.5	31 32.4	45.5	291 27.1	06.3	304 37.6	148	13 59.9	−106
	12	160 07.0	318 04.7	−11 29.5	246 55.2	−27 30.4	46 34.4	+21 45.4	306 29.4	−11 06.3	319 11.4	148	−14 10.5	−106
	13	175 09.4	333 04.9	30.7	261 56.5	30.3	61 36.4	45.3	321 31.7	06.4	333 45.2	147	14 21.1	−105
	14	190 11.9	348 05.1	31.8	276 57.9	30.2	76 38.3	45.3	336 33.9	06.5	348 18.9	146	14 31.6	−105
	15	205 14.3	3 05.3	·· 33.0	291 59.3	·· 30.1	91 40.3	·· 45.2	351 36.2	·· 06.6	2 52.5	147	·14 42.1	−104
	16	220 16.8	18 05.5	34.1	307 00.6	30.0	106 42.3	45.1	6 38.5	06.6	17 26.2	146	14 52.5	−103
	17	235 19.3	33 05.7	35.2	322 02.0	29.9	121 44.2	45.1	21 40.7	06.7	31 59.8	145	15 02.8	−103
	18	250 21.7	48 05.9	−11 36.4	337 03.3	−27 29.7	136 46.2	+21 45.0	36 43.0	−11 06.8	46 33.3	146	−15 13.1	−102
	19	265 24.2	63 06.1	37.5	352 04.7	29.6	151 48.2	44.9	51 45.3	06.9	61 06.9	145	15 23.3	−101
	20	280 26.7	78 06.3	38.7	7 06.0	29.5	166 50.1	44.9	66 47.5	07.0	75 40.4	144	15 33.4	−101
	21	295 29.1	93 06.5	·· 39.8	22 07.4	·· 29.4	181 52.1	·· 44.8	81 49.8	·· 07.0	90 13.8	144	·15 43.5	−100
	22	310 31.6	108 06.7	41.0	37 08.7	29.3	196 54.1	44.7	96 52.1	07.1	104 47.2	144	15 53.5	−100
	23	325 34.1	123 06.9	42.1	52 10.1	29.2	211 56.1	44.6	111 54.3	07.2	119 20.6	143	16 03.5	− 98
2	0	340 36.5	138 07.1	−11 43.3	67 11.4	−27 29.1	226 58.0	+21 44.6	126 56.6	−11 07.3	133 53.9	143	−16 13.3	− 98
	1	355 39.0	153 07.3	44.4	82 12.8	29.0	242 00.0	44.5	141 58.9	07.3	148 27.2	143	16 23.1	− 98
	2	10 41.5	168 07.5	45.6	97 14.1	28.9	257 02.0	44.4	157 01.1	07.4	163 00.5	142	16 32.9	− 96
	3	25 43.9	183 07.7	·· 46.7	112 15.5	·· 28.8	272 03.9	·· 44.4	172 03.4	·· 07.5	177 33.7	142	·16 42.5	− 96
	4	40 46.4	198 07.9	47.8	127 16.8	28.7	287 05.9	44.3	187 05.7	07.6	192 06.9	141	16 52.1	− 95
	5	55 48.8	213 08.1	49.0	142 18.2	28.6	302 07.9	44.2	202 07.9	07.6	206 40.0	141	17 01.6	− 95
	6	70 51.3	228 08.3	−11 50.1	157 19.5	−27 28.5	317 09.8	+21 44.2	217 10.2	−11 07.7	221 13.1	140	−17 11.1	− 93
	7	85 53.8	243 08.5	51.3	172 20.8	28.4	332 11.8	44.1	232 12.5	07.8	235 46.1	140	17 20.4	− 93
	8	100 56.2	258 08.7	52.4	187 22.2	28.3	347 13.8	44.0	247 14.7	07.9	250 19.1	140	17 29.7	− 93
	9	115 58.7	273 08.9	·· 53.5	202 23.5	·· 28.2	2 15.8	·· 44.0	262 17.0	·· 08.0	264 52.1	139	·17 39.0	− 91
	10	131 01.2	288 09.1	54.7	217 24.9	28.1	17 17.7	43.9	277 19.3	08.0	279 25.0	139	17 48.1	− 91
	11	146 03.6	303 09.4	55.8	232 26.2	28.0	32 19.7	43.8	292 21.5	08.1	293 57.9	138	17 57.2	− 90
	12	161 06.1	318 09.6	−11 57.0	247 27.5	−27 27.9	47 21.7	+21 43.7	307 23.8	−11 08.2	308 30.7	138	−18 06.2	− 89
	13	176 08.6	333 09.8	58.1	262 28.9	27.8	62 23.7	43.7	322 26.1	08.3	323 03.5	137	18 15.1	− 88
	14	191 11.0	348 10.0	11 59.2	277 30.2	27.7	77 25.6	43.6	337 28.3	08.3	337 36.2	137	18 23.9	− 88
	15	206 13.5	3 10.2	·12 00.4	292 31.5	·· 27.6	92 27.6	·· 43.5	352 30.6	·· 08.4	352 08.9	136	·18 32.7	− 87
	16	221 15.9	18 10.4	01.5	307 32.9	27.5	107 29.6	43.5	7 32.8	08.5	6 41.5	136	18 41.4	− 86
	17	236 18.4	33 10.6	02.7	322 34.2	27.4	122 31.5	43.4	22 35.1	08.6	21 14.1	136	18 50.0	− 85
	18	251 20.9	48 10.8	−12 03.8	337 35.5	−27 27.3	137 33.5	+21 43.3	37 37.4	−11 08.7	35 46.7	135	−18 58.5	− 84
	19	266 23.3	63 11.0	04.9	352 36.9	27.2	152 35.5	43.3	52 39.6	08.7	50 19.2	134	19 06.9	− 84
	20	281 25.8	78 11.2	06.1	7 38.2	27.1	167 37.5	43.2	67 41.9	08.8	64 51.6	134	19 15.3	− 83
	21	296 28.3	93 11.4	·· 07.2	22 39.5	·· 26.9	182 39.4	·· 43.1	82 44.2	·· 08.9	79 24.0	134	·19 23.6	− 81
	22	311 30.7	108 11.6	08.3	37 40.8	26.8	197 41.4	43.1	97 46.4	09.0	93 56.4	133	19 31.7	− 82
	23	326 33.2	123 11.8	09.5	52 42.2	26.7	212 43.4	43.0	112 48.7	09.0	108 28.7	132	19 39.9	− 80
3	0	341 35.7	138 12.1	−12 10.6	67 43.5	−27 26.6	227 45.4	+21 42.9	127 51.0	−11 09.1	123 00.9	132	−19 47.9	− 79
	1	356 38.1	153 12.3	11.7	82 44.8	26.5	242 47.3	42.8	142 53.2	09.2	137 33.1	132	19 55.8	− 79
	2	11 40.6	168 12.5	12.9	97 46.1	26.4	257 49.3	42.8	157 55.5	09.3	152 05.3	131	20 03.7	− 77
	3	26 43.1	183 12.7	·· 14.0	112 47.5	·· 26.3	272 51.3	·· 42.7	172 57.8	·· 09.3	166 37.4	130	·20 11.4	− 77
	4	41 45.5	198 12.9	15.1	127 48.8	26.2	287 53.3	42.6	188 00.0	09.4	181 09.4	131	20 19.1	− 76
	5	56 48.0	213 13.1	16.3	142 50.1	26.1	302 55.2	42.6	203 02.3	09.5	195 41.5	129	20 26.7	− 75
	6	71 50.4	228 13.3	−12 17.4	157 51.4	−27 26.0	317 57.2	+21 42.5	218 04.5	−11 09.6	210 13.4	129	−20 34.2	− 74
	7	86 52.9	243 13.5	18.5	172 52.8	25.9	332 59.2	42.4	233 06.8	09.7	224 45.3	129	20 41.6	− 73
	8	101 55.4	258 13.7	19.7	187 54.1	25.8	348 01.2	42.4	248 09.1	09.7	239 17.2	128	20 48.9	− 73
	9	116 57.8	273 14.0	·· 20.8	202 55.4	·· 25.7	3 03.1	·· 42.3	263 11.3	·· 09.8	253 49.0	127	·20 56.2	− 71
	10	132 00.3	288 14.2	21.9	217 56.7	25.6	18 05.1	42.2	278 13.6	09.9	268 20.7	127	21 03.3	− 70
	11	147 02.8	303 14.4	23.0	232 58.0	25.4	33 07.1	42.1	293 15.9	10.0	282 52.4	127	21 10.3	− 70
	12	162 05.2	318 14.6	−12 24.2	247 59.3	−27 25.3	48 09.1	+21 42.1	308 18.1	−11 10.0	297 24.1	126	−21 17.3	− 69
	13	177 07.7	333 14.8	25.3	263 00.6	25.2	63 11.0	42.0	323 20.4	10.1	311 55.7	125	21 24.2	− 67
	14	192 10.2	348 15.0	26.4	278 02.0	25.1	78 13.0	41.9	338 22.6	10.2	326 27.2	125	21 30.9	− 67
	15	207 12.6	3 15.2	·· 27.6	293 03.3	·· 25.0	93 15.0	·· 41.9	353 24.9	·· 10.3	340 58.7	125	·21 37.6	− 66
	16	222 15.1	18 15.5	28.7	308 04.6	24.9	108 17.0	41.8	8 27.2	10.4	355 30.2	124	21 44.2	− 65
	17	237 17.5	33 15.7	29.8	323 05.9	24.8	123 18.9	41.7	23 29.4	10.4	10 01.6	123	21 50.7	− 64
	18	252 20.0	48 15.9	−12 30.9	338 07.2	−27 24.7	138 20.9	+21 41.7	38 31.7	−11 10.5	24 32.9	123	−21 57.1	− 62
	19	267 22.5	63 16.1	32.1	353 08.5	24.6	153 22.9	41.6	53 34.0	10.6	39 04.2	123	22 03.3	− 62
	20	282 24.9	78 16.3	33.2	8 09.8	24.5	168 24.9	41.5	68 36.2	10.7	53 35.5	122	22 09.5	− 61
	21	297 27.4	93 16.5	·· 34.3	23 11.1	·· 24.3	183 26.9	·· 41.5	83 38.5	·· 10.8	68 06.7	121	·22 15.6	− 60
	22	312 29.9	108 16.8	35.4	38 12.4	24.2	198 28.8	41.4	98 40.7	10.8	82 37.8	121	22 21.6	− 59
	23	327 32.3	123 17.0	36.6	53 13.7	24.1	213 30.8	41.3	113 43.0	10.9	97 08.9	120	22 27.5	− 58
	24	342 34.8	138 17.2	−12 37.7	68 15.0	−27 24.0	228 32.8	+21 41.2	128 45.3	−11 11.0	111 39.9	120	−22 33.3	− 57
code		−	+ 2	− 11	+ 14	+ 1	+ 20	0	+ 23	− 1				

GMT		SUN GHA	SUN Dec.
h		° ′	° ′
1	0	179 56.3	+ 8 33.7
	1	194 56.5	32.8
	2	209 56.7	31.9
	3	224 56.9 ··	31.0
	4	239 57.0	30.1
	5	254 57.2	29.2
	6	269 57.4	+ 8 28.3
	7	284 57.6	27.4
	8	299 57.8	26.5
	9	314 58.0 ··	25.6
	10	329 58.2	24.7
	11	344 58.4	23.8
	12	359 58.6	+ 8 22.8
	13	14 58.8	21.9
	14	29 59.0	21.0
	15	44 59.2 ··	20.1
	16	59 59.4	19.2
	17	74 59.6	18.3
	18	89 59.8	+ 8 17.4
	19	105 00.0	16.5
	20	120 00.2	15.6
	21	135 00.4 ··	14.7
	22	150 00.6	13.8
	23	165 00.8	12.9
2	0	180 01.0	+ 8 12.0
	1	195 01.2	11.1
	2	210 01.4	10.1
	3	225 01.6 ··	09.2
	4	240 01.7	08.3
	5	255 01.9	07.4
	6	270 02.1	+ 8 06.5
	7	285 02.3	05.6
	8	300 02.5	04.7
	9	315 02.7 ··	03.8
	10	330 02.9	02.9
	11	345 03.1	02.0
	12	0 03.3	+ 8 01.0
	13	15 03.5	8 00.1
	14	30 03.7	7 59.2
	15	45 03.9 ··	58.3
	16	60 04.1	57.4
	17	75 04.3	56.5
	18	90 04.5	+ 7 55.6
	19	105 04.7	54.7
	20	120 04.9	53.7
	21	135 05.1 ··	52.8
	22	150 05.3	51.9
	23	165 05.5	51.0
3	0	180 05.7	+ 7 50.1
	1	195 05.9	49.2
	2	210 06.1	48.3
	3	225 06.3 ··	47.4
	4	240 06.5	46.4
	5	255 06.7	45.5
	6	270 06.9	+ 7 44.6
	7	285 07.1	43.7
	8	300 07.3	42.8
	9	315 07.5 ··	41.9
	10	330 07.7	40.9
	11	345 07.9	40.0
	12	0 08.1	+ 7 39.1
	13	15 08.3	38.2
	14	30 08.5	37.3
	15	45 08.7 ··	36.4
	16	60 08.9	35.4
	17	75 09.1	34.5
	18	90 09.4	+ 7 33.6
	19	105 09.6	32.7
	20	120 09.8	31.8
	21	135 10.0 ··	30.9
	22	150 10.2	29.9
	23	165 10.4	29.0
	24	180 10.6	+ 7 28.1
code		—	− 9

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.5	−40 28.7
5	Achernar	335 58.9	−57 27.6
30	Acrux	173 59.4	−62 51.1
19	Adhara	255 47.4	−28 54.3
10	Aldebaran	291 40.0	+16 25.3
32	Alioth	166 59.6	+56 12.4
34	Alkaid	153 33.7	+49 32.5
55	Al Na'ir	28 38.4	−47 10.7
15	Alnilam	276 31.1	− 1 13.6
25	Alphard	218 39.7	− 8 27.6
41	Alphecca	126 48.4	+26 52.1
1	Alpheratz	358 28.8	+28 50.6
51	Altair	62 50.9	+ 8 45.0
2	Ankaa	353 58.6	−42 32.8
42	Antares	113 20.3	−26 20.1
37	Arcturus	146 36.1	+19 25.1
43	Atria	109 01.8	−68 57.2
22	Avior	234 36.7	−59 21.6
13	Bellatrix	279 19.3	+ 6 18.8
16	Betelg'se	271 49.1	+ 7 24.2
17	Canopus	264 16.0	−52 39.9
12	Capella	281 39.7	+45 57.2
53	Deneb	50 01.2	+45 07.3
28	Denebola	183 18.8	+14 49.6
4	Diphda	349 39.7	−18 13.8
27	Dubhe	194 46.1	+61 59.8
14	Elnath	279 08.4	+28 34.3
47	Eltanin	91 06.4	+51 29.9
54	Enif	34 30.1	+ 9 40.2
56	Fomalhaut	16 12.1	−29 51.6
31	Gacrux	172 50.7	−56 51.7
29	Gienah	176 38.0	−17 17.5
35	Hadar	149 51.0	−60 09.6
6	Hamal	328 50.3	+23 15.1
48	Kaus Aust.	84 42.0	−34 24.6
40	Kochab	137 18.2	+74 20.6
57	Markab	14 21.9	+14 57.9
8	Menkar	315 01.0	+ 3 55.0
36	Menkent	148 59.9	−36 09.0
24	Miapl'dus	221 50.2	−69 31.7
9	Mirfak	309 43.4	+49 42.1
50	Nunki	76 52.6	−26 21.3
52	Peacock	54 28.0	−56 53.0
21	Pollux	244 21.8	+28 08.2
20	Procyon	245 46.0	+ 5 20.6
46	R'alhague	96 47.2	+12 35.6
26	Regulus	208 30.6	+12 11.4
11	Rigel	281 54.4	− 8 14.9
38	Rigil Kent.	140 52.5	−60 39.3
44	Sabik	103 03.0	−15 40.3
3	Schedar	350 30.5	+56 17.4
45	Shaula	97 21.6	−37 04.5
18	Sirius	259 12.7	−16 38.9
33	Spica	159 18.0	−10 55.6
23	Suhail	223 25.3	−43 14.8
49	Vega	81 08.6	+38 44.7
39	Zub'g'bi	137 54.4	−15 51.3

Lat.	Sunrise	Twlt. begins	Moonrise 1	Moonrise 2	Moonrise 3	Moonrise 4
N °	h m	h m	h m	h m	h m	h m
72	4 04	////	12 10	■	■	■
70	4 17	////	11 39	13 56	■	■
68	4 28	////	11 16	13 09	15 45	■
66	4 37	////	10 59	12 39	14 28	■
64	4 44	////	10 45	12 17	13 51	15 25
62	4 50	1 21	10 33	11 59	13 25	14 48
60	4 56	1 55	10 23	11 44	13 05	14 21
58	5 01	2 19	10 14	11 32	12 48	14 01
56	5 05	2 37	10 06	11 21	12 34	13 44
54	5 09	2 51	10 00	11 12	12 22	13 29
52	5 12	3 04	9 54	11 03	12 11	13 17
50	5 16	3 15	9 48	10 56	12 02	13 06
45	5 22	3 36	9 36	10 40	11 42	12 43
40	5 28	3 52	9 27	10 26	11 26	12 24
35	5 33	4 04	9 18	10 15	11 12	12 09
30	5 37	4 15	9 11	10 06	11 01	11 55
20	5 44	4 29	8 59	9 49	10 41	11 33
10	5 51	4 40	8 48	9 35	10 23	11 13
0	5 56	4 48	8 38	9 22	10 07	10 55
10	6 02	4 53	8 28	9 08	9 51	10 37
20	6 08	4 56	8 17	8 54	9 34	10 18
30	6 15	4 56	8 05	8 38	9 15	9 55
35	6 18	4 56	7 58	8 29	9 03	9 42
40	6 23	4 54	7 50	8 18	8 50	9 27
45	6 28	4 51	7 41	8 06	8 35	9 10
50	6 33	4 47	7 30	7 51	8 16	8 47
52	6 36	4 46	7 25	7 44	8 07	8 37
54	6 39	4 43	7 20	7 36	7 57	8 25
56	6 42	4 41	7 14	7 28	7 46	8 12
58	6 46	4 37	7 07	7 18	7 34	7 56
60	6 49	4 33	6 59	7 07	7 19	7 37
S						

Lat.	Sunset	Twlt. ends	Moonset 1	Moonset 2	Moonset 3	Moonset 4
N °	h m	h m	h m	h m	h m	h m
72	19 53	////	17 06	■	■	■
70	19 40	////	17 39	16 54	■	■
68	19 29	////	18 03	17 42	16 41	■
66	19 21	////	18 22	18 13	18 00	■
64	19 14	23 32	18 37	18 36	18 37	18 43
62	19 08	22 30	18 50	18 55	19 04	19 21
60	19 02	21 58	19 01	19 10	19 25	19 48
58	18 57	21 35	19 10	19 23	19 42	20 09
56	18 53	21 18	19 19	19 35	19 56	20 26
54	18 50	21 05	19 26	19 45	20 09	20 41
52	18 46	20 52	19 33	19 54	20 20	20 53
50	18 43	20 42	19 39	20 02	20 29	21 05
45	18 36	20 21	19 52	20 19	20 50	21 28
40	18 31	20 06	20 03	20 33	21 07	21 47
35	18 26	19 54	20 12	20 45	21 21	22 03
30	18 22	19 44	20 20	20 55	21 33	22 16
20	18 15	19 30	20 34	21 13	21 54	22 40
10	18 09	19 20	20 47	21 29	22 13	23 00
0	18 03	19 12	20 59	21 43	22 30	23 19
10	17 58	19 08	21 10	21 58	22 47	23 38
20	17 52	19 05	21 23	22 14	23 06	23 58
30	17 46	19 06	21 37	22 32	23 27	24 22
35	17 42	19 06	21 46	22 43	23 40	24 35
40	17 38	19 08	21 55	22 55	23 54	24 51
45	17 33	19 11	22 07	23 10	24 11	0 11
50	17 27	19 15	22 20	23 27	24 33	0 33
52	17 25	19 17	22 27	23 36	24 43	0 43
54	17 22	19 20	22 34	23 45	24 54	0 54
56	17 19	19 23	22 42	23 56	25 08	1 08
58	17 15	19 26	22 51	24 08	0 08	1 23
60	17 12	19 31	23 01	24 22	0 22	1 41
S						

Equation of Time (App.—Mean)

GMT	1	2	3
h	m s	m s	m s
0	− 0 15.3	+ 0 03.4	+ 0 22.5
6	− 0 10.7	+ 0 08.2	+ 0 27.3
12	− 0 06.0	+ 0 12.9	+ 0 32.2
18	− 0 01.3	+ 0 17.7	+ 0 37.0
24	+ 0 03.4	+ 0 22.5	+ 0 41.9

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
1	14 48	14 48	19 32	8 54	15 34
2	15 32	14 47	19 30	8 51	15 30
3	16 19	14 47	19 27	8 48	15 26
4	17 07	14 47	19 25	8 45	15 23

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.2	0.2	0.2
30	0.2	0.2	0.2
45	0.2	0.1	0.1
60	0.2	0.1	0.1
75	0.2	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	1	2	3
°	′	′	′
0	12.1	12.0	12.0
4	12.1	12.0	12.0
8	12.2	12.0	12.0
12	12.2	12.1	12.1
16	12.2	12.1	12.1
20	12.3	12.2	12.2
24	12.4	12.3	12.3
28	12.5	12.4	12.4
32	12.6	12.5	12.5
36	12.7	12.6	12.6
40	12.8	12.7	12.7
44	12.9	12.8	12.8
48	13.1	13.0	13.0
52	13.2	13.1	13.1
56	13.4	13.3	13.3
60	13.5	13.5	13.5
64	13.7	13.6	13.6
68	13.9	13.8	13.8
72	14.1	14.0	14.0
76	14.3	14.2	14.2
80	14.4	14.4	14.4
84	14.6	14.6	14.6
88	14.8	14.7	14.7
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	1	2	3
°	′	′	′
0	17.5	17.6	17.6
4	17.5	17.6	17.6
8	17.5	17.5	17.5
12	17.4	17.5	17.5
16	17.4	17.5	17.5
20	17.3	17.4	17.4
24	17.2	17.3	17.3
28	17.2	17.2	17.2
32	17.1	17.1	17.1
36	16.9	17.0	17.0
40	16.8	16.9	16.9
44	16.7	16.7	16.7
48	16.6	16.6	16.6
52	16.4	16.4	16.4
56	16.2	16.3	16.3
60	16.1	16.1	16.1
64	15.9	15.9	15.9
68	15.7	15.7	15.7
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.2	15.2	15.2
84	15.0	15.0	15.0
88	14.9	14.8	14.8
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −4.0 GHA	Dec.	MARS −0.9 GHA	Dec.	JUPITER −1.5 GHA	Dec.	SATURN 0.9 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
4 0	342 34.8	138 17.2	−12 37.7	68 15.0	−27 24.0	228 32.8	+21 41.2	128 45.3	−11 11.0	111 39.9	120	−22 33.3	− 57
1	357 37.3	153 17.4	38.8	83 16.3	23.9	243 34.8	41.2	143 47.5	11.1	126 10.9	120	22 39.0	− 56
2	12 39.7	168 17.6	39.9	98 17.6	23.8	258 36.7	41.1	158 49.8	11.1	140 41.9	119	22 44.6	− 55
3	27 42.2	183 17.9	•• 41.0	113 18.9	•• 23.7	273 38.7	•• 41.0	173 52.0	•• 11.2	155 12.8	118	·22 50.1	− 54
4	42 44.7	198 18.1	42.2	128 20.2	23.6	288 40.7	41.0	188 54.3	11.3	169 43.6	118	22 55.5	− 53
5	57 47.1	213 18.3	43.3	143 21.5	23.5	303 42.7	40.9	203 56.6	11.4	184 14.4	117	23 00.8	− 52
6	72 49.6	228 18.5	−12 44.4	158 22.8	−27 23.3	318 44.7	+21 40.8	218 58.8	−11 11.5	198 45.1	117	−23 06.0	− 50
7	87 52.0	243 18.7	45.5	173 24.1	23.2	333 46.6	40.8	234 01.1	11.5	213 15.8	116	23 11.0	− 50
8	102 54.5	258 19.0	46.7	188 25.4	23.1	348 48.6	40.7	249 03.3	11.6	227 46.4	116	23 16.0	− 49
9	117 57.0	273 19.2	•• 47.8	203 26.7	•• 23.0	3 50.6	•• 40.6	264 05.6	•• 11.7	242 17.0	116	·23 20.9	− 47
10	132 59.4	288 19.4	48.9	218 28.0	22.9	18 52.6	40.5	279 07.9	11.8	256 47.6	115	23 25.6	− 47
11	148 01.9	303 19.6	50.0	233 29.3	22.8	33 54.6	40.5	294 10.1	11.9	271 18.1	114	23 30.3	− 45
12	163 04.4	318 19.9	−12 51.1	248 30.6	−27 22.7	48 56.5	+21 40.4	309 12.4	−11 11.9	285 48.5	114	−23 34.8	− 45
13	178 06.8	333 20.1	52.2	263 31.9	22.6	63 58.5	40.3	324 14.7	12.0	300 18.9	113	23 39.3	− 43
14	193 09.3	348 20.3	53.4	278 33.2	22.4	79 00.5	40.3	339 16.9	12.1	314 49.2	113	23 43.6	− 42
15	208 11.8	3 20.5	•• 54.5	293 34.5	•• 22.3	94 02.5	•• 40.2	354 19.2	•• 12.2	329 19.5	113	·23 47.8	− 41
16	223 14.2	18 20.7	55.6	308 35.8	22.2	109 04.5	40.1	9 21.4	12.2	343 49.8	112	23 51.9	− 40
17	238 16.7	33 21.0	56.7	323 37.1	22.1	124 06.5	40.1	24 23.7	12.3	358 20.0	111	23 55.9	− 39
18	253 19.2	48 21.2	−12 57.8	338 38.3	−27 22.0	139 08.4	+21 40.0	39 25.9	−11 12.4	12 50.1	111	−23 59.8	− 38
19	268 21.6	63 21.4	12 58.9	353 39.6	21.9	154 10.4	39.9	54 28.2	12.5	27 20.2	111	24 03.6	− 37
20	283 24.1	78 21.6	13 00.1	8 40.9	21.8	169 12.4	39.9	69 30.5	12.6	41 50.3	110	24 07.3	− 35
21	298 26.5	93 21.9	•• 01.2	23 42.2	•• 21.7	184 14.4	•• 39.8	84 32.7	•• 12.6	56 20.3	110	·24 10.8	− 35
22	313 29.0	108 22.1	02.3	38 43.5	21.5	199 16.4	39.7	99 35.0	12.7	70 50.3	109	24 14.3	− 33
23	328 31.5	123 22.3	03.4	53 44.8	21.4	214 18.3	39.6	114 37.2	12.8	85 20.2	109	24 17.6	− 32
5 0	343 33.9	138 22.6	−13 04.5	68 46.1	−27 21.3	229 20.3	+21 39.6	129 39.5	−11 12.9	99 50.1	108	−24 20.8	− 31
1	358 36.4	153 22.8	05.6	83 47.3	21.2	244 22.3	39.5	144 41.8	13.0	114 19.9	108	24 23.9	− 30
2	13 38.9	168 23.0	06.7	98 48.6	21.1	259 24.3	39.4	159 44.0	13.0	128 49.7	108	24 26.9	− 29
3	28 41.3	183 23.2	•• 07.8	113 49.9	•• 21.0	274 26.3	•• 39.4	174 46.3	•• 13.1	143 19.5	107	·24 29.8	− 27
4	43 43.8	198 23.5	09.0	128 51.2	20.8	289 28.3	39.3	189 48.5	13.2	157 49.2	107	24 32.5	− 27
5	58 46.3	213 23.7	10.1	143 52.4	20.7	304 30.2	39.2	204 50.8	13.3	172 18.9	106	24 35.2	− 25
6	73 48.7	228 23.9	−13 11.2	158 53.7	−27 20.6	319 32.2	+21 39.2	219 53.1	−11 13.4	186 48.5	106	−24 37.7	− 24
7	88 51.2	243 24.2	12.3	173 55.0	20.5	334 34.2	39.1	234 55.3	13.4	201 18.1	105	24 40.1	− 23
8	103 53.7	258 24.4	13.4	188 56.3	20.4	349 36.2	39.0	249 57.6	13.5	215 47.6	105	24 42.4	− 21
9	118 56.1	273 24.6	•• 14.5	203 57.6	•• 20.3	4 38.2	•• 39.0	264 59.8	•• 13.6	230 17.1	105	·24 44.5	− 21
10	133 58.6	288 24.8	15.6	218 58.8	20.1	19 40.2	38.9	280 02.1	13.7	244 46.6	104	24 46.6	− 19
11	149 01.0	303 25.1	16.7	234 00.1	20.0	34 42.1	38.8	295 04.3	13.7	259 16.0	104	24 48.5	− 18
12	164 03.5	318 25.3	−13 17.8	249 01.4	−27 19.9	49 44.1	+21 38.7	310 06.6	−11 13.8	273 45.4	103	−24 50.3	− 17
13	179 06.0	333 25.5	18.9	264 02.6	19.8	64 46.1	38.7	325 08.9	13.9	288 14.7	103	24 52.0	− 16
14	194 08.4	348 25.8	20.0	279 03.9	19.7	79 48.1	38.6	340 11.1	14.0	302 44.0	103	24 53.6	− 14
15	209 10.9	3 26.0	•• 21.1	294 05.2	•• 19.6	94 50.1	•• 38.5	355 13.4	•• 14.1	317 13.3	103	·24 55.0	− 13
16	224 13.4	18 26.2	22.2	309 06.4	19.4	109 52.1	38.5	10 15.6	14.1	331 42.6	102	24 56.3	− 12
17	239 15.8	33 26.5	23.4	324 07.7	19.3	124 54.0	38.4	25 17.9	14.2	346 11.8	101	24 57.5	− 11
18	254 18.3	48 26.7	−13 24.5	339 09.0	−27 19.2	139 56.0	+21 38.3	40 20.1	−11 14.3	0 40.9	102	−24 58.6	− 10
19	269 20.8	63 26.9	25.6	354 10.2	19.1	154 58.0	38.3	55 22.4	14.4	15 10.1	101	24 59.6	− 8
20	284 23.2	78 27.2	26.7	9 11.5	19.0	170 00.0	38.2	70 24.7	14.5	29 39.2	101	25 00.4	− 7
21	299 25.7	93 27.4	•• 27.8	24 12.8	•• 18.8	185 02.0	•• 38.1	85 26.9	•• 14.5	44 08.3	100	·25 01.1	− 6
22	314 28.1	108 27.7	28.9	39 14.0	18.7	200 04.0	38.1	100 29.2	14.6	58 37.3	100	25 01.7	− 5
23	329 30.6	123 27.9	30.0	54 15.3	18.6	215 06.0	38.0	115 31.4	14.7	73 06.3	100	25 02.2	− 3
6 0	344 33.1	138 28.1	−13 31.1	69 16.6	−27 18.5	230 07.9	+21 37.9	130 33.7	−11 14.8	87 35.3	99	−25 02.5	− 2
1	359 35.5	153 28.4	32.2	84 17.8	18.4	245 09.9	37.8	145 35.9	14.9	102 04.2	100	25 02.7	− 1
2	14 38.0	168 28.6	33.3	99 19.1	18.2	260 11.9	37.8	160 38.2	14.9	116 33.2	99	25 02.8	0
3	29 40.5	183 28.8	•• 34.4	114 20.3	•• 18.1	275 13.9	•• 37.7	175 40.4	•• 15.0	131 02.1	98	·25 02.8	+ 2
4	44 42.9	198 29.1	35.5	129 21.6	18.0	290 15.9	37.6	190 42.7	15.1	145 30.9	99	25 02.6	+ 3
5	59 45.4	213 29.3	36.6	144 22.9	17.9	305 17.9	37.6	205 45.0	15.2	159 59.8	98	25 02.3	+ 4
6	74 47.9	228 29.5	−13 37.7	159 24.1	−27 17.8	320 19.9	+21 37.5	220 47.2	−11 15.3	174 28.6	98	−25 01.9	+ 6
7	89 50.3	243 29.8	38.8	174 25.4	17.6	335 21.9	37.4	235 49.5	15.3	188 57.4	97	25 01.3	+ 6
8	104 52.8	258 30.0	39.9	189 26.6	17.5	350 23.8	37.4	250 51.7	15.4	203 26.1	98	25 00.7	+ 8
9	119 55.3	273 30.3	•• 41.0	204 27.9	•• 17.4	5 25.8	•• 37.3	265 54.0	•• 15.5	217 54.9	97	·24 59.9	+ 9
10	134 57.7	288 30.5	42.1	219 29.1	17.3	20 27.8	37.2	280 56.2	15.6	232 23.6	97	24 59.0	+ 11
11	150 00.2	303 30.7	43.2	234 30.4	17.2	35 29.8	37.2	295 58.5	15.7	246 52.3	97	24 57.9	+ 12
12	165 02.6	318 31.0	−13 44.2	249 31.6	−27 17.0	50 31.8	+21 37.1	311 00.7	−11 15.7	261 21.0	97	−24 56.7	+ 13
13	180 05.1	333 31.2	45.3	264 32.9	16.9	65 33.8	37.0	326 03.0	15.8	275 49.7	96	24 55.4	+ 14
14	195 07.6	348 31.5	46.4	279 34.1	16.8	80 35.8	36.9	341 05.2	15.9	290 18.3	96	24 54.0	+ 16
15	210 10.0	3 31.7	•• 47.5	294 35.4	•• 16.7	95 37.8	•• 36.9	356 07.5	•• 16.0	304 46.9	96	·24 52.4	+ 17
16	225 12.5	18 32.0	48.6	309 36.6	16.6	110 39.8	36.8	11 09.8	16.1	319 15.5	96	24 50.7	+ 18
17	240 15.0	33 32.2	49.7	324 37.9	16.4	125 41.7	36.7	26 12.0	16.1	333 44.1	96	24 48.9	+ 20
18	255 17.4	48 32.4	−13 50.8	339 39.1	−27 16.3	140 43.7	+21 36.7	41 14.3	−11 16.2	348 12.7	95	−24 46.9	+ 20
19	270 19.9	63 32.7	51.9	354 40.4	16.2	155 45.7	36.6	56 16.5	16.3	2 41.2	96	24 44.9	+ 23
20	285 22.4	78 32.9	53.0	9 41.6	16.1	170 47.7	36.5	71 18.8	16.4	17 09.8	95	24 42.6	+ 23
21	300 24.8	93 33.2	•• 54.1	24 42.8	•• 15.9	185 49.7	•• 36.5	86 21.0	•• 16.5	31 38.3	95	·24 40.3	+ 25
22	315 27.3	108 33.4	55.2	39 44.1	15.8	200 51.7	36.4	101 23.3	16.5	46 06.8	95	24 37.8	+ 26
23	330 29.8	123 33.7	56.3	54 45.3	15.7	215 53.7	36.3	116 25.5	16.6	60 35.3	95	24 35.2	+ 27
24	345 32.2	138 33.9	−13 57.4	69 46.6	−27 15.6	230 55.7	+21 36.3	131 27.8	−11 16.7	75 03.8	95	−24 32.5	+ 29
code	—	+ 2	− 11	+ 12	+ 1	+ 20	0	+ 23	− 1				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
4 0	180 10.6	+ 7 28.1
1	195 10.8	27.2
2	210 11.0	26.3
3	225 11.2 ··	25.3
4	240 11.4	24.4
5	255 11.6	23.5
6	270 11.8	+ 7 22.6
7	285 12.0	21.7
8	300 12.2	20.7
9	315 12.4 ··	19.8
10	330 12.6	18.9
11	345 12.8	18.0
12	0 13.0	+ 7 17.1
13	15 13.2	16.1
14	30 13.4	15.2
15	45 13.6 ··	14.3
16	60 13.8	13.4
17	75 14.0	12.5
18	90 14.2	+ 7 11.5
19	105 14.4	10.6
20	120 14.7	09.7
21	135 14.9 ··	08.8
22	150 15.1	07.8
23	165 15.3	06.9
5 0	180 15.5	+ 7 06.0
1	195 15.7	05.1
2	210 15.9	04.1
3	225 16.1 ··	03.2
4	240 16.3	02.3
5	255 16.5	01.4
6	270 16.7	+ 7 00.4
7	285 16.9	6 59.5
8	300 17.1	58.6
9	315 17.3 ··	57.7
10	330 17.5	56.7
11	345 17.7	55.8
12	0 18.0	+ 6 54.9
13	15 18.2	54.0
14	30 18.4	53.0
15	45 18.6 ··	52.1
16	60 18.8	51.2
17	75 19.0	50.3
18	90 19.2	+ 6 49.3
19	105 19.4	48.4
20	120 19.6	47.5
21	135 19.8 ··	46.5
22	150 20.0	45.6
23	165 20.2	44.7
6 0	180 20.4	+ 6 43.8
1	195 20.7	42.8
2	210 20.9	41.9
3	225 21.1 ··	41.0
4	240 21.3	40.1
5	255 21.5	39.1
6	270 21.7	+ 6 38.2
7	285 21.9	37.3
8	300 22.1	36.3
9	315 22.3 ··	35.4
10	330 22.5	34.5
11	345 22.7	33.5
12	0 23.0	+ 6 32.6
13	15 23.2	31.7
14	30 23.4	30.8
15	45 23.6 ··	29.8
16	60 23.8	28.9
17	75 24.0	28.0
18	90 24.2	+ 6 27.0
19	105 24.4	26.1
20	120 24.6	25.2
21	135 24.8 ··	24.2
22	150 25.1	23.3
23	165 25.3	22.4
24	180 25.5	+ 6 21.4
code	—	− 9

STARS No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.5	−40 28.7
5	Achernar	335 58.9	−57 27.6
30	Acrux	173 59.4	−62 51.1
19	Adhara	255 47.3	−28 54.3
10	Aldebaran	291 39.9	+16 25.3
32	Alioth	166 59.6	+56 12.4
34	Alkaid	153 33.8	+49 32.5
55	Al Na'ir	28 38.4	−47 10.8
15	Alnilam	276 31.1	− 1 13.6
25	Alphard	218 39.7	− 8 27.6
41	Alphecca	126 48.4	+26 52.1
1	Alpheratz	358 28.8	+28 50.6
51	Altair	62 51.0	+ 8 45.0
2	Ankaa	353 58.6	−42 32.8
42	Antares	113 20.4	−26 20.1
37	Arcturus	146 36.1	+19 25.1
43	Atria	109 01.8	−68 57.2
22	Avior	234 36.7	−59 21.6
13	Bellatrix	279 19.3	+ 6 18.8
16	Betelg'se	271 49.1	+ 7 24.2
17	Canopus	264 15.9	−52 39.9
12	Capella	281 39.6	+45 57.2
53	Deneb	50 01.2	+45 07.3
28	Denebola	183 18.8	+14 49.6
4	Diphda	349 39.7	−18 13.8
27	Dubhe	194 46.1	+61 59.7
14	Elnath	279 08.4	+28 34.3
47	Eltanin	91 06.5	+51 29.9
54	Enif	34 30.1	+ 9 40.2
56	Fomalhaut	16 12.1	−29 51.6
31	Gacrux	172 50.7	−56 51.7
29	Gienah	176 38.0	−17 17.5
35	Hadar	149 51.0	−60 09.6
6	Hamal	328 50.3	+23 15.1
48	Kaus Aust.	84 42.0	−34 24.6
40	Kochab	137 18.3	+74 20.6
57	Markab	14 21.9	+14 57.9
8	Menkar	315 01.0	+ 3 55.0
36	Menkent	148 59.9	−36 09.0
24	Miapl'dus	221 50.2	−69 31.7
9	Mirfak	309 43.4	+49 42.1
50	Nunki	76 52.7	−26 21.3
52	Peacock	54 28.0	−56 53.0
21	Pollux	244 21.8	+28 08.2
20	Procyon	245 46.0	+ 5 20.6
46	R'alhague	96 47.3	+12 35.6
26	Regulus	208 30.6	+12 11.4
11	Rigel	281 54.4	− 8 14.9
38	Rigil Kent.	140 52.5	−60 39.3
44	Sabik	103 03.0	−15 40.3
3	Schedar	350 30.5	+56 17.4
45	Shaula	97 21.7	−37 04.5
18	Sirius	259 12.7	−16 38.9
33	Spica	159 18.0	−10 55.6
23	Suhail	223 25.3	−43 14.8
49	Vega	81 08.6	+38 44.7
39	Zub'g'bi	137 54.4	−15 51.3

Lat.	Sunrise	Twlt. begins	Moonrise 4	5	6	7
N °	h m	h m	h m	h m	h m	h m
72	4 18	////	■	■	■	■
70	4 30	////	■	■	■	■
68	4 39	////	■	■	■	■
66	4 46	////	■	■	■	18 45
64	4 53	0 58	15 25	16 48	17 35	17 49
62	4 58	1 43	14 48	15 59	16 48	17 16
60	5 03	2 10	14 21	15 28	16 18	16 52
58	5 07	2 30	14 01	15 05	15 55	16 32
56	5 11	2 46	13 44	14 46	15 37	16 16
54	5 14	2 59	13 29	14 30	15 21	16 02
52	5 17	3 12	13 17	14 16	15 08	15 50
50	5 20	3 21	13 06	14 04	14 56	15 39
45	5 26	3 41	12 43	13 40	14 31	15 16
40	5 31	3 56	12 24	13 20	14 12	14 58
35	5 35	4 07	12 09	13 04	13 55	14 43
30	5 39	4 16	11 55	12 49	13 41	14 29
20	5 45	4 30	11 33	12 25	13 17	14 07
10	5 51	4 40	11 13	12 04	12 56	13 47
0	5 55	4 47	10 55	11 45	12 36	13 29
10	6 01	4 51	10 37	11 26	12 17	13 10
20	6 06	4 54	10 18	11 05	11 56	12 50
30	6 11	4 53	9 55	10 41	11 32	12 28
35	6 14	4 52	9 42	10 27	11 18	12 14
40	6 18	4 50	9 27	10 11	11 01	11 59
45	6 22	4 46	9 10	9 51	10 42	11 40
50	6 27	4 41	8 47	9 27	10 17	11 17
52	6 29	4 40	8 37	9 16	10 05	11 06
54	6 32	4 36	8 25	9 02	9 52	10 53
56	6 35	4 33	8 12	8 47	9 36	10 39
58	6 38	4 30	7 56	8 29	9 17	10 22
60 S	6 41	4 25	7 37	8 07	8 54	10 01

Lat.	Sunset	Twlt. ends	Moonset 4	5	6	7
N °	h m	h m	h m	h m	h m	h m
72	19 36	////	■	■	■	■
70	19 25	////	■	■	■	■
68	19 16	////	■	■	■	■
66	19 09	////	■	■	■	20 45
64	19 03	22 47	18 43	19 05	20 06	21 41
62	18 58	22 08	19 21	19 54	20 52	22 13
60	18 53	21 42	19 48	20 25	21 22	22 37
58	18 49	21 22	20 09	20 49	21 45	22 57
56	18 45	21 06	20 26	21 07	22 03	23 13
54	18 42	20 54	20 41	21 23	22 19	23 26
52	18 39	20 43	20 53	21 37	22 32	23 38
50	18 37	20 34	21 05	21 49	22 44	23 49
45	18 31	20 15	21 28	22 14	23 08	24 10
40	18 26	20 00	21 47	22 34	23 28	24 28
35	18 22	19 49	22 03	22 50	23 44	24 43
30	18 18	19 40	22 16	23 05	23 58	24 56
20	18 12	19 26	22 40	23 29	24 22	0 22
10	18 07	19 18	23 00	23 50	24 42	0 42
0	18 02	19 11	23 19	24 10	0 10	1 01
10	17 57	19 07	23 38	24 29	0 29	1 21
20	17 53	19 06	23 58	24 50	0 50	1 41
30	17 47	19 07	24 22	0 22	1 14	2 04
35	17 44	19 08	24 35	0 35	1 29	2 18
40	17 40	19 10	24 51	0 51	1 45	2 34
45	17 36	19 14	0 11	1 10	2 05	2 53
50	17 31	19 19	0 33	1 34	2 29	3 17
52	17 29	19 21	0 43	1 46	2 41	3 28
54	17 27	19 25	0 54	1 59	2 55	3 41
56	17 24	19 28	1 08	2 14	3 10	3 55
58	17 21	19 32	1 23	2 32	3 29	4 13
60 S	17 18	19 37	1 41	2 54	3 52	4 34

GMT	Equation of Time (App.—Mean) 4	5	6
h	m s	m s	m s
0	+ 0 41.9	+ 1 01.5	+ 1 21.4
6	+ 0 46.7	+ 1 06.4	+ 1 26.4
12	+ 0 51.6	+ 1 11.4	+ 1 31.4
18	+ 0 56.6	+ 1 16.4	+ 1 36.4
24	+ 1 01.5	+ 1 21.4	+ 1 41.5

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
4	17 07	14 47	19 25	8 45	15 23
5	17 57	14 46	19 23	8 42	15 19
6	18 49	14 46	19 21	8 38	15 16
7	19 41	14 46	19 19	8 35	15 12

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.2	0.2	0.2
30			
	0.2	0.2	0.2
45			
	0.2	0.1	0.1
60			
	0.2	0.1	0.1
75			
	0.2	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	4	5	6
°	′	′	′
0			
	12.2	12.6	13.3
4			
	12.3	12.6	13.3
8			
	12.3	12.7	13.3
12			
	12.3	12.7	13.3
16			
	12.4	12.7	13.3
20			
	12.4	12.8	13.4
24			
	12.5	12.9	13.4
28			
	12.6	12.9	13.5
32			
	12.7	13.0	13.6
36			
	12.8	13.1	13.6
40			
	12.9	13.2	13.7
44			
	13.0	13.3	13.8
48			
	13.2	13.4	13.9
52			
	13.3	13.6	14.0
56			
	13.5	13.7	14.1
60			
	13.6	13.8	14.2
64			
	13.8	14.0	14.3
68			
	14.0	14.1	14.4
72			
	14.1	14.3	14.6
76			
	14.3	14.4	14.7
80			
	14.5	14.6	14.8
84			
	14.7	14.8	14.9
88			
	14.8	14.9	15.0
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	4	5	6
°	′	′	′
0			
	17.4	17.2	16.9
4			
	17.4	17.2	16.8
8			
	17.4	17.2	16.8
12			
	17.4	17.2	16.8
16			
	17.3	17.1	16.8
20			
	17.3	17.1	16.7
24			
	17.2	17.0	16.7
28			
	17.1	16.9	16.6
32			
	17.0	16.8	16.6
36			
	16.9	16.7	16.5
40			
	16.8	16.6	16.4
44			
	16.6	16.5	16.3
48			
	16.5	16.4	16.2
52			
	16.4	16.3	16.1
56			
	16.2	16.1	16.0
60			
	16.1	16.0	15.9
64			
	15.9	15.9	15.8
68			
	15.7	15.7	15.7
72			
	15.6	15.6	15.6
76			
	15.4	15.4	15.4
80			
	15.2	15.2	15.3
84			
	15.0	15.1	15.2
88			
	14.9	15.0	15.1
90			

Subtract from table, back cover

First Quarter 5
Labor Day 6

GMT	♈ GHA	VENUS −4.0 GHA	VENUS Dec.	MARS −0.9 GHA	MARS Dec.	JUPITER −1.6 GHA	JUPITER Dec.	SATURN 0.9 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
7 0	345 32.2	138 33.9	−13 57.4	69 46.6	−27 15.6	230 55.7	+21 36.3	131 27.8	−11 16.7	75 03.8	95	−24 32.5	+29
1	0 34.7	153 34.2	58.4	84 47.8	15.4	245 57.7	36.2	146 30.0	16.8	89 32.3	95	24 29.6	+29
2	15 37.1	168 34.4	13 59.5	99 49.1	15.3	260 59.7	36.1	161 32.3	16.9	104 00.8	94	24 26.7	+32
3	30 39.6	183 34.7	·14 00.6	114 50.3	·· 15.2	276 01.6	·· 36.0	176 34.5	·· 16.9	118 29.2	95	·24 23.5	+32
4	45 42.1	198 34.9	01.7	129 51.5	15.1	291 03.6	36.0	191 36.8	17.0	132 57.7	94	24 20.3	+34
5	60 44.5	213 35.2	02.8	144 52.8	14.9	306 05.6	35.9	206 39.1	17.1	147 26.1	95	24 16.9	+35
6	75 47.0	228 35.4	−14 03.9	159 54.0	−27 14.8	321 07.6	+21 35.8	221 41.3	−11 17.2	161 54.6	94	−24 13.4	+36
7	90 49.5	243 35.7	05.0	174 55.2	14.7	336 09.6	35.8	236 43.6	17.3	176 23.0	95	24 09.8	+38
8	105 51.9	258 35.9	06.1	189 56.5	14.6	351 11.6	35.7	251 45.8	17.4	190 51.5	94	24 06.0	+39
9	120 54.4	273 36.2	·· 07.1	204 57.7	·· 14.4	6 13.6	·· 35.6	266 48.1	·· 17.4	205 19.9	94	·24 02.1	+40
10	135 56.9	288 36.4	08.2	219 58.9	14.3	21 15.6	35.6	281 50.3	17.5	219 48.3	94	23 58.1	+42
11	150 59.3	303 36.7	09.3	235 00.2	14.2	36 17.6	35.5	296 52.6	17.6	234 16.7	94	23 53.9	+43
12	166 01.8	318 36.9	−14 10.4	250 01.4	−27 14.1	51 19.6	+21 35.4	311 54.8	−11 17.7	248 45.1	95	−23 49.6	+44
13	181 04.2	333 37.2	11.5	265 02.6	13.9	66 21.6	35.4	326 57.1	17.8	263 13.6	94	23 45.2	+45
14	196 06.7	348 37.4	12.6	280 03.9	13.8	81 23.6	35.3	341 59.3	17.8	277 42.0	94	23 40.7	+47
15	211 09.2	3 37.7	·· 13.6	295 05.1	·· 13.7	96 25.5	·· 35.2	357 01.6	·· 17.9	292 10.4	94	·23 36.0	+48
16	226 11.6	18 37.9	14.7	310 06.3	13.6	111 27.5	35.1	12 03.8	18.0	306 38.8	94	23 31.2	+49
17	241 14.1	33 38.2	15.8	325 07.5	13.4	126 29.5	35.1	27 06.1	18.1	321 07.2	95	23 26.3	+51
18	256 16.6	48 38.4	−14 16.9	340 08.8	−27 13.3	141 31.5	+21 35.0	42 08.3	−11 18.2	335 35.7	94	−23 21.2	+52
19	271 19.0	63 38.7	18.0	355 10.0	13.2	156 33.5	34.9	57 10.6	18.2	350 04.1	94	23 16.0	+53
20	286 21.5	78 38.9	19.0	10 11.2	13.0	171 35.5	34.9	72 12.8	18.3	4 32.5	95	23 10.7	+54
21	301 24.0	93 39.2	·· 20.1	25 12.4	·· 12.9	186 37.5	·· 34.8	87 15.1	·· 18.4	19 01.0	94	·23 05.3	+56
22	316 26.4	108 39.4	21.2	40 13.7	12.8	201 39.5	34.7	102 17.3	18.5	33 29.4	94	22 59.7	+57
23	331 28.9	123 39.7	22.3	55 14.9	12.7	216 41.5	34.7	117 19.6	18.6	47 57.8	95	22 54.0	+58
8 0	346 31.4	138 40.0	−14 23.4	70 16.1	−27 12.5	231 43.5	+21 34.6	132 21.8	−11 18.6	62 26.3	94	−22 48.2	+60
1	1 33.8	153 40.2	24.4	85 17.3	12.4	246 45.5	34.5	147 24.1	18.7	76 54.7	95	22 42.2	+61
2	16 36.3	168 40.5	25.5	100 18.5	12.3	261 47.5	34.5	162 26.3	18.8	91 23.2	95	22 36.1	+62
3	31 38.7	183 40.7	·· 26.6	115 19.8	·· 12.1	276 49.5	·· 34.4	177 28.6	·· 18.9	105 51.7	95	·22 29.9	+63
4	46 41.2	198 41.0	27.7	130 21.0	12.0	291 51.5	34.3	192 30.8	19.0	120 20.2	95	22 23.6	+65
5	61 43.7	213 41.2	28.7	145 22.2	11.9	306 53.5	34.3	207 33.1	19.1	134 48.7	95	22 17.1	+66
6	76 46.1	228 41.5	−14 29.8	160 23.4	−27 11.8	321 55.5	+21 34.2	222 35.3	−11 19.1	149 17.2	95	−22 10.5	+67
7	91 48.6	243 41.8	30.9	175 24.6	11.6	336 57.5	34.1	237 37.6	19.2	163 45.7	95	22 03.8	+68
8	106 51.1	258 42.0	32.0	190 25.8	11.5	351 59.5	34.0	252 39.8	19.3	178 14.2	95	21 57.0	+70
9	121 53.5	273 42.3	·· 33.0	205 27.1	·· 11.4	7 01.5	·· 34.0	267 42.1	·· 19.4	192 42.7	96	·21 50.0	+71
10	136 56.0	288 42.5	34.1	220 28.3	11.2	22 03.5	33.9	282 44.3	19.5	207 11.3	95	21 42.9	+72
11	151 58.5	303 42.8	35.2	235 29.5	11.1	37 05.4	33.8	297 46.6	19.5	221 39.8	96	21 35.7	+73
12	167 00.9	318 43.1	−14 36.2	250 30.7	−27 11.0	52 07.4	+21 33.8	312 48.8	−11 19.6	236 08.4	96	−21 28.4	+75
13	182 03.4	333 43.3	37.3	265 31.9	10.8	67 09.4	33.7	327 51.1	19.7	250 37.0	96	21 20.9	+76
14	197 05.9	348 43.6	38.4	280 33.1	10.7	82 11.4	33.6	342 53.3	19.8	265 05.6	96	21 13.3	+77
15	212 08.3	3 43.9	·· 39.5	295 34.3	·· 10.6	97 13.4	·· 33.6	357 55.6	·· 19.9	279 34.2	96	·21 05.6	+78
16	227 10.8	18 44.1	40.5	310 35.5	10.4	112 15.4	33.5	12 57.8	19.9	294 02.8	97	20 57.8	+80
17	242 13.2	33 44.4	41.6	325 36.7	10.3	127 17.4	33.4	28 00.1	20.0	308 31.5	96	20 49.8	+80
18	257 15.7	48 44.6	−14 42.7	340 38.0	−27 10.2	142 19.4	+21 33.4	43 02.3	−11 20.1	323 00.1	97	−20 41.8	+82
19	272 18.2	63 44.9	43.7	355 39.2	10.0	157 21.4	33.3	58 04.6	20.2	337 28.8	97	20 33.6	+83
20	287 20.6	78 45.2	44.8	10 40.4	09.9	172 23.4	33.2	73 06.8	20.3	351 57.5	97	20 25.3	+85
21	302 23.1	93 45.4	·· 45.9	25 41.6	·· 09.8	187 25.4	·· 33.1	88 09.1	·· 20.4	6 26.2	97	·20 16.8	+85
22	317 25.6	108 45.7	46.9	40 42.8	09.6	202 27.4	33.1	103 11.3	20.4	20 54.9	98	20 08.3	+87
23	332 28.0	123 46.0	48.0	55 44.0	09.5	217 29.4	33.0	118 13.6	20.5	35 23.7	97	19 59.6	+87
9 0	347 30.5	138 46.2	−14 49.1	70 45.2	−27 09.4	232 31.4	+21 32.9	133 15.8	−11 20.6	49 52.4	98	−19 50.9	+89
1	2 33.0	153 46.5	50.1	85 46.4	09.2	247 33.4	32.9	148 18.1	20.7	64 21.2	98	19 42.0	+91
2	17 35.4	168 46.8	51.2	100 47.6	09.1	262 35.4	32.8	163 20.3	20.8	78 50.0	98	19 32.9	+91
3	32 37.9	183 47.0	·· 52.3	115 48.8	·· 09.0	277 37.4	·· 32.7	178 22.6	·· 20.9	93 18.8	98	·19 23.8	+92
4	47 40.4	198 47.3	53.3	130 50.0	08.8	292 39.4	32.7	193 24.8	20.9	107 47.6	99	19 14.6	+94
5	62 42.8	213 47.6	54.4	145 51.2	08.7	307 41.4	32.6	208 27.1	21.0	122 16.5	98	19 05.2	+95
6	77 45.3	228 47.9	−14 55.4	160 52.4	−27 08.6	322 43.4	+21 32.5	223 29.3	−11 21.1	136 45.3	99	−18 55.7	+96
7	92 47.7	243 48.1	56.5	175 53.6	08.4	337 45.4	32.5	238 31.6	21.2	151 14.2	99	18 46.1	+97
8	107 50.2	258 48.4	57.6	190 54.8	08.3	352 47.4	32.4	253 33.8	21.3	165 43.1	100	18 36.4	+98
9	122 52.7	273 48.7	·· 58.6	205 56.0	·· 08.2	7 49.4	·· 32.3	268 36.1	·· 21.3	180 12.1	99	·18 26.6	+99
10	137 55.1	288 48.9	14 59.7	220 57.2	08.0	22 51.4	32.3	283 38.3	21.4	194 41.0	100	18 16.7	+100
11	152 57.6	303 49.2	15 00.7	235 58.4	07.9	37 53.4	32.2	298 40.6	21.5	209 10.0	99	18 06.7	+102
12	168 00.1	318 49.5	−15 01.8	250 59.5	−27 07.8	52 55.4	+21 32.1	313 42.8	−11 21.6	223 38.9	100	−17 56.5	+102
13	183 02.5	333 49.8	02.9	266 00.7	07.6	67 57.4	32.0	328 45.0	21.7	238 07.9	101	17 46.3	+104
14	198 05.0	348 50.0	03.9	281 01.9	07.5	82 59.4	32.0	343 47.3	21.8	252 37.0	100	17 35.9	+105
15	213 07.5	3 50.3	·· 05.0	296 03.1	·· 07.3	98 01.4	·· 31.9	358 49.5	·· 21.8	267 06.0	100	·17 25.4	+105
16	228 09.9	18 50.6	06.0	311 04.3	07.2	113 03.4	31.8	13 51.8	21.9	281 35.0	101	17 14.9	+107
17	243 12.4	33 50.9	07.1	326 05.5	07.1	128 05.4	31.8	28 54.0	22.0	296 04.1	101	17 04.2	+108
18	258 14.8	48 51.1	−15 08.1	341 06.7	−27 06.9	143 07.4	+21 31.7	43 56.3	−11 22.1	310 33.2	101	−16 53.4	+109
19	273 17.3	63 51.4	09.2	356 07.9	06.8	158 09.4	31.6	58 58.5	22.2	325 02.3	102	16 42.5	+110
20	288 19.8	78 51.7	10.2	11 09.1	06.7	173 11.4	31.6	74 00.8	22.2	339 31.5	101	16 31.5	+111
21	303 22.2	93 52.0	·· 11.3	26 10.2	·· 06.5	188 13.4	·· 31.5	89 03.0	·· 22.3	354 00.6	102	·16 20.4	+112
22	318 24.7	108 52.2	12.4	41 11.4	06.4	203 15.4	31.4	104 05.3	22.4	8 29.8	102	16 09.2	+113
23	333 27.2	123 52.5	13.4	56 12.6	06.2	218 17.4	31.4	119 07.5	22.5	22 59.0	102	15 57.9	+114
24	348 29.6	138 52.8	−15 14.5	71 13.8	−27 06.1	233 19.5	+21 31.3	134 09.8	−11 22.6	37 28.2	102	−15 46.5	+115
code	−	+2	−11	+12	+2	+20	−1	+23	−1				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
7 0	180 25.5	+ 6 21.4
1	195 25.7	20.5
2	210 25.9	19.6
3	225 26.1 ••	18.6
4	240 26.3	17.7
5	255 26.5	16.8
6	270 26.7	+ 6 15.8
7	285 27.0	14.9
8	300 27.2	14.0
9	315 27.4 ••	13.0
10	330 27.6	12.1
11	345 27.8	11.2
12	0 28.0	+ 6 10.2
13	15 28.2	09.3
14	30 28.4	08.4
15	45 28.7 ••	07.4
16	60 28.9	06.5
17	75 29.1	05.5
18	90 29.3	+ 6 04.6
19	105 29.5	03.7
20	120 29.7	02.7
21	135 29.9 ••	01.8
22	150 30.1	6 00.9
23	165 30.4	5 59.9
8 0	180 30.6	+ 5 59.0
1	195 30.8	58.1
2	210 31.0	57.1
3	225 31.2 ••	56.2
4	240 31.4	55.2
5	255 31.6	54.3
6	270 31.8	+ 5 53.4
7	285 32.1	52.4
8	300 32.3	51.5
9	315 32.5 ••	50.6
10	330 32.7	49.6
11	345 32.9	48.7
12	0 33.1	+ 5 47.7
13	15 33.3	46.8
14	30 33.6	45.9
15	45 33.8 ••	44.9
16	60 34.0	44.0
17	75 34.2	43.0
18	90 34.4	+ 5 42.1
19	105 34.6	41.2
20	120 34.8	40.2
21	135 35.1 ••	39.3
22	150 35.3	38.3
23	165 35.5	37.4
9 0	180 35.7	+ 5 36.5
1	195 35.9	35.5
2	210 36.1	34.6
3	225 36.4 ••	33.6
4	240 36.6	32.7
5	255 36.8	31.8
6	270 37.0	+ 5 30.8
7	285 37.2	29.9
8	300 37.4	28.9
9	315 37.6 ••	28.0
10	330 37.9	27.0
11	345 38.1	26.1
12	0 38.3	+ 5 25.2
13	15 38.5	24.2
14	30 38.7	23.3
15	45 38.9 ••	22.3
16	60 39.2	21.4
17	75 39.4	20.4
18	90 39.6	+ 5 19.5
19	105 39.8	18.6
20	120 40.0	17.6
21	135 40.2 ••	16.7
22	150 40.5	15.7
23	165 40.7	14.8
24	180 40.9	+ 5 13.8
code	—	− 9

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.4	−40 28.7
5	Achernar	335 58.9	−57 27.6
30	Acrux	173 59.4	−62 51.1
19	Adhara	255 47.3	−28 54.3
10	Aldebaran	291 39.9	+16 25.3
32	Alioth	166 59.6	+56 12.4
34	Alkaid	153 33.8	+49 32.5
55	Al Na'ir	28 38.4	−47 10.8
15	Alnilam	276 31.1	− 1 13.6
25	Alphard	218 39.6	− 8 27.6
41	Alphecca	126 48.4	+26 52.1
1	Alpheratz	358 28.8	+28 50.6
51	Altair	62 51.0	+ 8 45.0
2	Ankaa	353 58.6	−42 32.8
42	Antares	113 20.4	−26 20.1
37	Arcturus	146 36.1	+19 25.1
43	Atria	109 01.8	−68 57.2
22	Avior	234 36.6	−59 21.6
13	Bellatrix	279 19.3	+ 6 18.8
16	Betelg'se	271 49.0	+ 7 24.2
17	Canopus	264 15.9	−52 39.9
12	Capella	281 39.6	+45 57.2
53	Deneb	50 01.2	+45 07.3
28	Denebola	183 18.8	+14 49.6
4	Diphda	349 39.7	−18 13.8
27	Dubhe	194 46.1	+61 59.7
14	Elnath	279 08.4	+28 34.3
47	Eltanin	91 06.5	+51 29.9
54	Enif	34 30.1	+ 9 40.2
56	Fomalhaut	16 12.1	−29 51.6
31	Gacrux	172 50.7	−56 51.7
29	Gienah	176 38.0	−17 17.4
35	Hadar	149 51.0	−60 09.6
6	Hamal	328 50.3	+23 15.1
48	Kaus Aust.	84 42.1	−34 24.6
40	Kochab	137 18.3	+74 20.6
57	Markab	14 21.9	+14 57.9
8	Menkar	315 01.0	+ 3 55.0
36	Menkent	148 59.9	−36 09.0
24	Miapl'dus	221 50.1	−69 31.7
9	Mirfak	309 43.3	+49 42.1
50	Nunki	76 52.7	−26 21.3
52	Peacock	54 28.0	−56 53.0
21	Pollux	244 21.7	+28 08.2
20	Procyon	245 46.0	+ 5 20.6
46	R'alhague	96 47.3	+12 35.6
26	Regulus	208 30.6	+12 11.4
11	Rigel	281 54.4	− 8 14.9
38	Rigil Kent.	140 52.5	−60 39.3
44	Sabik	103 03.0	−15 40.3
3	Schedar	350 30.4	+56 17.4
45	Shaula	97 21.7	−37 04.5
18	Sirius	259 12.7	−16 38.9
33	Spica	159 18.0	−10 55.6
23	Suhail	223 25.3	−43 14.8
49	Vega	81 08.6	+38 44.7
39	Zub'g'bi	137 54.4	−15 51.3

Lat.	Sunrise	Twlt. begins	Moonrise 7	Moonrise 8	Moonrise 9	Moonrise 10
N °	h m	h m	h m	h m	h m	h m
72	4 32	////	■	■	19 51	18 53
70	4 42	////	■	■	19 05	18 33
68	4 50	////	■	19 06	18 34	18 17
66	4 56	0 10	18 45	18 22	18 12	18 04
64	5 01	1 26	17 49	17 53	17 53	17 53
62	5 06	1 59	17 16	17 30	17 38	17 43
60	5 10	2 23	16 52	17 12	17 26	17 35
58	5 14	2 41	16 32	16 57	17 15	17 28
56	5 17	2 56	16 16	16 44	17 05	17 22
54	5 20	3 08	16 02	16 33	16 57	17 16
52	5 22	3 19	15 50	16 23	16 49	17 11
50	5 25	3 27	15 39	16 14	16 42	17 06
45	5 30	3 45	15 16	15 55	16 27	16 56
40	5 34	3 59	14 58	15 39	16 15	16 48
35	5 37	4 10	14 43	15 26	16 05	16 40
30	5 40	4 19	14 29	15 14	15 55	16 34
20	5 46	4 31	14 07	14 54	15 40	16 23
10	5 50	4 40	13 47	14 37	15 26	16 13
0	5 54	4 46	13 29	14 21	15 13	16 04
10	5 59	4 49	13 10	14 05	15 00	15 54
20	6 03	4 51	12 50	13 47	14 45	15 44
30	6 07	4 50	12 28	13 27	14 29	15 33
35	6 10	4 48	12 14	13 15	14 20	15 26
40	6 13	4 45	11 59	13 02	14 09	15 19
45	6 16	4 40	11 40	12 46	13 56	15 10
50	6 21	4 35	11 17	12 26	13 41	14 59
52	6 22	4 32	11 06	12 16	13 33	14 54
54	6 24	4 29	10 53	12 06	13 25	14 49
56	6 27	4 25	10 39	11 54	13 16	14 43
58	6 29	4 21	10 22	11 40	13 06	14 36
60	6 32	4 15	10 01	11 23	12 54	14 28
S						

Lat.	Sunset	Twlt. ends	Moonset 7	Moonset 8	Moonset 9	Moonset 10
N °	h m	h m	h m	h m	h m	h m
72	19 20	////	■	■	23 20	26 05
70	19 11	////	■	■	24 04	0 04
68	19 04	////	■	22 13	24 33	0 33
66	18 58	23 16	20 45	22 57	24 55	0 55
64	18 52	22 19	21 41	23 25	25 12	1 12
62	18 48	21 49	22 13	23 47	25 26	1 26
60	18 44	21 27	22 37	24 05	0 05	1 38
58	18 41	21 10	22 57	24 19	0 19	1 48
56	18 38	20 56	23 13	24 32	0 32	1 57
54	18 35	20 44	23 26	24 43	0 43	2 04
52	18 32	20 34	23 38	24 52	0 52	2 11
50	18 30	20 25	23 49	25 01	1 01	2 18
45	18 25	20 08	24 10	0 10	1 19	2 31
40	18 21	19 54	24 28	0 28	1 33	2 42
35	18 18	19 44	24 43	0 43	1 46	2 51
30	18 15	19 36	24 56	0 56	1 57	3 00
20	18 10	19 24	0 22	1 17	2 15	3 14
10	18 05	19 15	0 42	1 36	2 31	3 26
0	18 01	19 10	1 01	1 54	2 46	3 37
10	17 57	19 07	1 21	2 11	3 00	3 48
20	17 53	19 06	1 41	2 30	3 16	4 00
30	17 49	19 08	2 04	2 51	3 34	4 14
35	17 46	19 10	2 18	3 03	3 44	4 21
40	17 43	19 13	2 34	3 18	3 56	4 30
45	17 40	19 18	2 53	3 35	4 10	4 40
50	17 36	19 24	3 17	3 55	4 27	4 53
52	17 34	19 27	3 28	4 05	4 35	4 59
54	17 32	19 30	3 41	4 16	4 43	5 05
56	17 30	19 34	3 55	4 29	4 53	5 12
58	17 28	19 40	4 13	4 43	5 04	5 20
60	17 25	19 45	4 34	5 00	5 17	5 28
S						

GMT	Equation of Time (App.—Mean) 7	8	9
h	m s	m s	m s
0	+ 1 41.5	+ 2 01.9	+ 2 22.4
6	+ 1 46.6	+ 2 07.0	+ 2 27.6
12	+ 1 51.6	+ 2 12.1	+ 2 32.7
18	+ 1 56.7	+ 2 17.2	+ 2 37.9
24	+ 2 01.9	+ 2 22.4	+ 2 43.1

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
7	19 41	14 46	19 19	8 35	15 12
8	20 33	14 45	19 17	8 32	15 08
9	21 25	14 45	19 16	8 29	15 05
10	22 16	14 44	19 14	8 26	15 01

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.2	0.2	0.2
30			
	0.2	0.2	0.2
45			
	0.2	0.1	0.1
60			
	0.2	0.1	0.1
75			
	0.2	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	7	8	9
°	′	′	′
0			
	14.2	15.2	16.2
4			
	14.2	15.2	16.2
8			
	14.2	15.2	16.2
12			
	14.2	15.2	16.2
16			
	14.2	15.2	16.2
20			
	14.2	15.2	16.2
24			
	14.3	15.2	16.1
28			
	14.3	15.2	16.1
32			
	14.3	15.2	16.1
36			
	14.4	15.2	16.1
40			
	14.4	15.2	16.1
44			
	14.5	15.3	16.0
48			
	14.5	15.3	16.0
52			
	14.6	15.3	16.0
56			
	14.7	15.3	16.0
60			
	14.7	15.3	15.9
64			
	14.8	15.3	15.9
68			
	14.9	15.4	15.9
72			
	14.9	15.4	15.8
76			
	15.0	15.4	15.8
80			
	15.1	15.4	15.8
84			
	15.2	15.4	15.7
88			
	15.2	15.5	15.7
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	7	8	9
°	′	′	′
0			
	16.4	15.8	15.2
4			
	16.3	15.8	15.2
8			
	16.3	15.8	15.2
12			
	16.3	15.8	15.2
16			
	16.3	15.8	15.2
20			
	16.3	15.7	15.2
24			
	16.2	15.7	15.2
28			
	16.2	15.7	15.3
32			
	16.2	15.7	15.3
36			
	16.1	15.7	15.3
40			
	16.1	15.7	15.3
44			
	16.0	15.7	15.3
48			
	16.0	15.7	15.4
52			
	15.9	15.6	15.4
56			
	15.8	15.6	15.4
60			
	15.8	15.6	15.5
64			
	15.7	15.6	15.5
68			
	15.6	15.6	15.5
72			
	15.6	15.6	15.5
76			
	15.5	15.5	15.6
80			
	15.4	15.5	15.6
84			
	15.3	15.5	15.7
88			
	15.3	15.5	15.7
90			

Subtract from table, back cover

GMT		♈ GHA	VENUS −4.0 GHA	VENUS Dec.	MARS −0.8 GHA	MARS Dec.	JUPITER −1.6 GHA	JUPITER Dec.	SATURN 0.9 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
10	0	348 29.6	138 52.8	−15 14.5	71 13.8	−27 06.1	233 19.5	+21 31.3	134 09.8	−11 22.6	37 28.2	102	−15 46.5	+115
	1	3 32.1	153 53.1	15.5	86 15.0	06.0	248 21.5	31.2	149 12.0	22.7	51 57.4	102	15 35.0	+116
	2	18 34.6	168 53.4	16.6	101 16.2	05.8	263 23.5	31.2	164 14.2	22.7	66 26.6	103	15 23.4	+117
	3	33 37.0	183 53.6	·· 17.6	116 17.3	·· 05.7	278 25.5	·· 31.1	179 16.5	·· 22.8	80 55.9	103	·15 11.7	+118
	4	48 39.5	198 53.9	18.7	131 18.5	05.6	293 27.5	31.0	194 18.7	22.9	95 25.2	103	14 59.9	+118
	5	63 42.0	213 54.2	19.7	146 19.7	05.4	308 29.5	30.9	209 21.0	23.0	109 54.5	103	14 48.1	+120
	6	78 44.4	228 54.5	−15 20.8	161 20.9	−27 05.3	323 31.5	+21 30.9	224 23.2	−11 23.1	124 23.8	103	−14 36.1	+121
	7	93 46.9	243 54.8	21.8	176 22.1	05.1	338 33.5	30.8	239 25.5	23.2	138 53.1	104	14 24.0	+122
	8	108 49.3	258 55.0	22.9	191 23.2	05.0	353 35.5	30.7	254 27.7	23.2	153 22.5	103	14 11.8	+122
	9	123 51.8	273 55.3	·· 23.9	206 24.4	·· 04.9	8 37.5	·· 30.7	269 30.0	·· 23.3	167 51.8	104	·13 59.6	+124
	10	138 54.3	288 55.6	25.0	221 25.6	04.7	23 39.5	30.6	284 32.2	23.4	182 21.2	104	13 47.2	+124
	11	153 56.7	303 55.9	26.0	236 26.8	04.6	38 41.5	30.5	299 34.5	23.5	196 50.6	104	13 34.8	+125
	12	168 59.2	318 56.2	−15 27.0	251 27.9	−27 04.4	53 43.5	+21 30.5	314 36.7	−11 23.6	211 20.0	104	−13 22.3	+126
	13	184 01.7	333 56.5	28.1	266 29.1	04.3	68 45.5	30.4	329 38.9	23.7	225 49.4	105	13 09.7	+127
	14	199 04.1	348 56.7	29.1	281 30.3	04.1	83 47.5	30.3	344 41.2	23.7	240 18.9	104	12 57.0	+128
	15	214 06.6	3 57.0	·· 30.2	296 31.5	·· 04.0	98 49.5	·· 30.3	359 43.4	·· 23.8	254 48.3	105	·12 44.2	+129
	16	229 09.1	18 57.3	31.2	311 32.6	03.9	113 51.5	30.2	14 45.7	23.9	269 17.8	105	12 31.3	+129
	17	244 11.5	33 57.6	32.3	326 33.8	03.7	128 53.5	30.1	29 47.9	24.0	283 47.3	105	12 18.4	+131
	18	259 14.0	48 57.9	−15 33.3	341 35.0	−27 03.6	143 55.5	+21 30.1	44 50.2	−11 24.1	298 16.8	105	−12 05.3	+131
	19	274 16.4	63 58.2	34.3	356 36.1	03.4	158 57.5	30.0	59 52.4	24.1	312 46.3	105	11 52.2	+132
	20	289 18.9	78 58.5	35.4	11 37.3	03.3	173 59.6	29.9	74 54.7	24.2	327 15.8	105	11 39.0	+132
	21	304 21.4	93 58.8	·· 36.4	26 38.5	·· 03.2	189 01.6	·· 29.8	89 56.9	·· 24.3	341 45.3	106	·11 25.8	+134
	22	319 23.8	108 59.0	37.5	41 39.6	03.0	204 03.6	29.8	104 59.1	24.4	356 14.9	105	11 12.4	+134
	23	334 26.3	123 59.3	38.5	56 40.8	02.9	219 05.6	29.7	120 01.4	24.5	10 44.4	106	10 59.0	+135
11	0	349 28.8	138 59.6	−15 39.5	71 42.0	−27 02.7	234 07.6	+21 29.6	135 03.6	−11 24.6	25 14.0	106	−10 45.5	+136
	1	4 31.2	153 59.9	40.6	86 43.1	02.6	249 09.6	29.6	150 05.9	24.6	39 43.6	105	10 31.9	+136
	2	19 33.7	169 00.2	41.6	101 44.3	02.4	264 11.6	29.5	165 08.1	24.7	54 13.1	106	10 18.3	+137
	3	34 36.2	184 00.5	·· 42.7	116 45.5	·· 02.3	279 13.6	·· 29.4	180 10.4	·· 24.8	68 42.7	106	·10 04.6	+138
	4	49 38.6	199 00.8	43.7	131 46.6	02.1	294 15.6	29.4	195 12.6	24.9	83 12.3	106	9 50.8	+139
	5	64 41.1	214 01.1	44.7	146 47.8	02.0	309 17.6	29.3	210 14.8	25.0	97 41.9	106	9 36.9	+139
	6	79 43.6	229 01.4	−15 45.8	161 49.0	−27 01.9	324 19.6	+21 29.2	225 17.1	−11 25.1	112 11.5	107	− 9 23.0	+140
	7	94 46.0	244 01.7	46.8	176 50.1	01.7	339 21.6	29.2	240 19.3	25.1	126 41.2	106	9 09.0	+140
	8	109 48.5	259 02.0	47.8	191 51.3	01.6	354 23.6	29.1	255 21.6	25.2	141 10.8	106	8 55.0	+142
	9	124 50.9	274 02.3	·· 48.9	206 52.4	·· 01.4	9 25.7	·· 29.0	270 23.8	·· 25.3	155 40.4	106	· 8 40.8	+141
	10	139 53.4	289 02.6	49.9	221 53.6	01.3	24 27.7	29.0	285 26.1	25.4	170 10.0	107	8 26.7	+143
	11	154 55.9	304 02.9	50.9	236 54.7	01.1	39 29.7	28.9	300 28.3	25.5	184 39.7	106	8 12.4	+143
	12	169 58.3	319 03.1	−15 52.0	251 55.9	−27 01.0	54 31.7	+21 28.8	315 30.5	−11 25.6	199 09.3	106	− 7 58.1	+143
	13	185 00.8	334 03.4	53.0	266 57.1	00.8	69 33.7	28.8	330 32.8	25.6	213 38.9	107	7 43.8	+145
	14	200 03.3	349 03.7	54.0	281 58.2	00.7	84 35.7	28.7	345 35.0	25.7	228 08.6	106	7 29.3	+144
	15	215 05.7	4 04.0	·· 55.1	296 59.4	·· 00.5	99 37.7	·· 28.6	0 37.3	·· 25.8	242 38.2	107	· 7 14.9	+145
	16	230 08.2	19 04.3	56.1	312 00.5	00.4	114 39.7	28.5	15 39.5	25.9	257 07.9	106	7 00.4	+146
	17	245 10.7	34 04.6	57.1	327 01.7	00.2	129 41.7	28.5	30 41.8	26.0	271 37.5	107	6 45.8	+147
	18	260 13.1	49 04.9	−15 58.1	342 02.8	−27 00.1	144 43.7	+21 28.4	45 44.0	−11 26.1	286 07.2	106	− 6 31.1	+146
	19	275 15.6	64 05.2	15 59.2	357 04.0	27 00.0	159 45.8	28.3	60 46.2	26.1	300 36.8	106	6 16.5	+148
	20	290 18.1	79 05.5	16 00.2	12 05.1	26 59.8	174 47.8	28.3	75 48.5	26.2	315 06.4	107	6 01.7	+147
	21	305 20.5	94 05.8	·· 01.2	27 06.3	·· 59.7	189 49.8	·· 28.2	90 50.7	·· 26.3	329 36.1	106	· 5 47.0	+149
	22	320 23.0	109 06.1	02.3	42 07.4	59.5	204 51.8	28.1	105 53.0	26.4	344 05.7	106	5 32.1	+148
	23	335 25.4	124 06.4	03.3	57 08.6	59.4	219 53.8	28.1	120 55.2	26.5	358 35.3	106	5 17.3	+149
12	0	350 27.9	139 06.7	−16 04.3	72 09.7	−26 59.2	234 55.8	+21 28.0	135 57.4	−11 26.6	13 04.9	106	− 5 02.4	+150
	1	5 30.4	154 07.0	05.3	87 10.9	59.1	249 57.8	27.9	150 59.7	26.6	27 34.5	106	4 47.4	+150
	2	20 32.8	169 07.4	06.4	102 12.0	58.9	264 59.8	27.9	166 01.9	26.7	42 04.1	106	4 32.4	+150
	3	35 35.3	184 07.7	·· 07.4	117 13.2	·· 58.8	280 01.9	·· 27.8	181 04.2	·· 26.8	56 33.7	106	· 4 17.4	+151
	4	50 37.8	199 08.0	08.4	132 14.3	58.6	295 03.9	27.7	196 06.4	26.9	71 03.3	106	4 02.3	+151
	5	65 40.2	214 08.3	09.4	147 15.5	58.5	310 05.9	27.7	211 08.6	27.0	85 32.9	106	3 47.2	+151
	6	80 42.7	229 08.6	−16 10.4	162 16.6	−26 58.3	325 07.9	+21 27.6	226 10.9	−11 27.1	100 02.5	105	− 3 32.1	+152
	7	95 45.2	244 08.9	11.5	177 17.8	58.2	340 09.9	27.5	241 13.1	27.1	114 32.0	106	3 16.9	+152
	8	110 47.6	259 09.2	12.5	192 18.9	58.0	355 11.9	27.5	256 15.4	27.2	129 01.6	105	3 01.7	+152
	9	125 50.1	274 09.5	·· 13.5	207 20.0	·· 57.9	10 13.9	·· 27.4	271 17.6	·· 27.3	143 31.1	105	· 2 46.5	+152
	10	140 52.5	289 09.8	14.5	222 21.2	57.7	25 15.9	27.3	286 19.8	27.4	158 00.6	105	2 31.3	+153
	11	155 55.0	304 10.1	15.5	237 22.3	57.6	40 18.0	27.2	301 22.1	27.5	172 30.1	105	2 16.0	+153
	12	170 57.5	319 10.4	−16 16.6	252 23.5	−26 57.4	55 20.0	+21 27.2	316 24.3	−11 27.6	186 59.6	105	− 2 00.7	+154
	13	185 59.9	334 10.7	17.6	267 24.6	57.3	70 22.0	27.1	331 26.6	27.7	201 29.1	104	1 45.3	+153
	14	201 02.4	349 11.0	18.6	282 25.7	57.1	85 24.0	27.0	346 28.8	27.7	215 58.5	104	1 30.0	+154
	15	216 04.9	4 11.4	·· 19.6	297 26.9	·· 56.9	100 26.0	·· 27.0	1 31.0	·· 27.8	230 27.9	105	· 1 14.6	+154
	16	231 07.3	19 11.7	20.6	312 28.0	56.8	115 28.0	26.9	16 33.3	27.9	244 57.4	104	0 59.2	+154
	17	246 09.8	34 12.0	21.6	327 29.1	56.6	130 30.0	26.8	31 35.5	28.0	259 26.8	103	0 43.8	+154
	18	261 12.3	49 12.3	−16 22.7	342 30.3	−26 56.5	145 32.1	+21 26.8	46 37.8	−11 28.1	273 56.1	104	− 0 28.4	+154
	19	276 14.7	64 12.6	23.7	357 31.4	56.3	160 34.1	26.7	61 40.0	28.2	288 25.5	103	− 0 13.0	+155
	20	291 17.2	79 12.9	24.7	12 32.6	56.2	175 36.1	26.6	76 42.2	28.2	302 54.8	103	+ 0 02.5	+154
	21	306 19.7	94 13.2	·· 25.7	27 33.7	·· 56.0	190 38.1	·· 26.6	91 44.5	·· 28.3	317 24.1	103	· 0 17.9	+155
	22	321 22.1	109 13.5	26.7	42 34.8	55.9	205 40.1	26.5	106 46.7	28.4	331 53.4	103	0 33.4	+155
	23	336 24.6	124 13.9	27.7	57 36.0	55.7	220 42.1	26.4	121 49.0	28.5	346 22.7	102	0 48.9	+154
	24	351 27.0	139 14.2	−16 28.7	72 37.1	−26 55.6	235 44.2	+21 26.4	136 51.2	−11 28.6	0 51.9	102	+ 1 04.3	+155
code		—	+ 3	− 10	+ 12	+ 2	+ 20	0	+ 23	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
10 0	180 40.9	+ 5 13.8
1	195 41.1	12.9
2	210 41.3	11.9
3	225 41.5	·· 11.0
4	240 41.8	10.1
5	255 42.0	09.1
6	270 42.2	+ 5 08.2
7	285 42.4	07.2
8	300 42.6	06.3
9	315 42.8	·· 05.3
10	330 43.1	04.4
11	345 43.3	03.4
12	0 43.5	+ 5 02.5
13	15 43.7	01.5
14	30 43.9	5 00.6
15	45 44.2	· 4 59.6
16	60 44.4	58.7
17	75 44.6	57.8
18	90 44.8	+ 4 56.8
19	105 45.0	55.9
20	120 45.2	54.9
21	135 45.5	·· 54.0
22	150 45.7	53.0
23	165 45.9	52.1
11 0	180 46.1	+ 4 51.1
1	195 46.3	50.2
2	210 46.6	49.2
3	225 46.8	·· 48.3
4	240 47.0	47.3
5	255 47.2	46.4
6	270 47.4	+ 4 45.4
7	285 47.6	44.5
8	300 47.9	43.5
9	315 48.1	·· 42.6
10	330 48.3	41.6
11	345 48.5	40.7
12	0 48.7	+ 4 39.7
13	15 49.0	38.8
14	30 49.2	37.8
15	45 49.4	·· 36.9
16	60 49.6	35.9
17	75 49.8	35.0
18	90 50.1	+ 4 34.0
19	105 50.3	33.1
20	120 50.5	32.1
21	135 50.7	·· 31.2
22	150 50.9	30.2
23	165 51.2	29.3
12 0	180 51.4	+ 4 28.3
1	195 51.6	27.4
2	210 51.8	26.4
3	225 52.0	·· 25.5
4	240 52.3	24.5
5	255 52.5	23.6
6	270 52.7	+ 4 22.6
7	285 52.9	21.7
8	300 53.1	20.7
9	315 53.4	·· 19.8
10	330 53.6	18.8
11	345 53.8	17.8
12	0 54.0	+ 4 16.9
13	15 54.2	15.9
14	30 54.5	15.0
15	45 54.7	·· 14.0
16	60 54.9	13.1
17	75 55.1	12.1
18	90 55.3	+ 4 11.2
19	105 55.6	10.2
20	120 55.8	09.3
21	135 56.0	·· 08.3
22	150 56.2	07.4
23	165 56.4	06.4
24	180 56.7	+ 4 05.4
code	—	− 9

STARS No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.4	−40 28.7
5	Achernar	335 58.8	−57 27.6
30	Acrux	173 59.4	−62 51.0
19	Adhara	255 47.3	−28 54.3
10	Aldebaran	291 39.9	+16 25.3
32	Alioth	166 59.6	+56 12.4
34	Alkaid	153 33.8	+49 32.5
55	Al Na'ir	28 38.4	−47 10.8
15	Alnilam	276 31.1	− 1 13.6
25	Alphard	218 39.6	− 8 27.6
41	Alphecca	126 48.4	+26 52.1
1	Alpheratz	358 28.8	+28 50.6
51	Altair	62 51.0	+ 8 45.0
2	Ankaa	353 58.6	−42 32.8
42	Antares	113 20.4	−26 20.1
37	Arcturus	146 36.1	+19 25.1
43	Atria	109 01.9	−68 57.2
22	Avior	234 36.6	−59 21.6
13	Bellatrix	279 19.3	+ 6 18.8
16	Betelg'se	271 49.0	+ 7 24.2
17	Canopus	264 15.9	−52 39.9
12	Capella	281 39.6	+45 57.2
53	Deneb	50 01.2	+45 07.3
28	Denebola	183 18.8	+14 49.6
4	Diphda	349 39.7	−18 13.8
27	Dubhe	194 46.1	+61 59.7
14	Elnath	279 08.3	+28 34.3
47	Eltanin	91 06.5	+51 29.9
54	Enif	34 30.1	+ 9 40.2
56	Fomalhaut	16 12.1	−29 51.6
31	Gacrux	172 50.7	−56 51.7
29	Gienah	176 38.0	−17 17.4
35	Hadar	149 51.1	−60 09.6
6	Hamal	328 50.3	+23 15.1
48	Kaus Aust.	84 42.1	−34 24.6
40	Kochab	137 18.4	+74 20.6
57	Markab	14 21.9	+14 57.9
8	Menkar	315 00.9	+ 3 55.0
36	Menkent	148 59.9	−36 09.0
24	Miapl'dus	221 50.1	−69 31.7
9	Mirfak	309 43.3	+49 42.1
50	Nunki	76 52.7	−26 21.3
52	Peacock	54 28.0	−56 53.0
21	Pollux	244 21.7	+28 08.2
20	Procyon	245 46.0	+ 5 20.6
46	R'alhague	96 47.3	+12 35.6
26	Regulus	208 30.6	+12 11.4
11	Rigel	281 54.4	− 8 14.9
38	Rigil Kent.	140 52.5	−60 39.3
44	Sabik	103 03.1	−15 40.3
3	Schedar	350 30.4	+56 17.4
45	Shaula	97 21.7	−37 04.5
18	Sirius	259 12.6	−16 38.9
33	Spica	159 18.0	−10 55.5
23	Suhail	223 25.3	−43 14.8
49	Vega	81 08.6	+38 44.7
39	Zub'g'bi	137 54.4	−15 51.3

Lat.	Sunrise	Twlt. begins	Moonrise 10	11	12	13
N °	h m	h m	h m	h m	h m	h m
72	4 46	////	18 53	18 20	17 52	17 25
70	4 54	////	18 33	18 11	17 52	17 33
68	5 00	////	18 17	18 03	17 51	17 39
66	5 06	1 05	18 04	17 57	17 50	17 44
64	5 10	1 48	17 53	17 51	17 50	17 48
62	5 14	2 15	17 43	17 47	17 49	17 52
60	5 17	2 35	17 35	17 42	17 49	17 55
58	5 20	2 51	17 28	17 39	17 49	17 58
56	5 23	3 05	17 22	17 36	17 48	18 01
54	5 25	3 15	17 16	17 33	17 48	18 04
52	5 27	3 25	17 11	17 30	17 48	18 06
50	5 29	3 33	17 06	17 27	17 47	18 08
45	5 33	3 50	16 56	17 22	17 47	18 12
40	5 36	4 03	16 48	17 17	17 46	18 16
35	5 39	4 13	16 40	17 14	17 46	18 19
30	5 42	4 20	16 34	17 10	17 46	18 22
20	5 46	4 32	16 23	17 04	17 45	18 27
10	5 50	4 40	16 13	16 59	17 45	18 32
0	5 53	4 45	16 04	16 54	17 44	18 36
10	5 57	4 47	15 54	16 49	17 44	18 40
20	6 00	4 48	15 44	16 44	17 44	18 45
30	6 04	4 46	15 33	16 38	17 43	18 50
35	6 06	4 43	15 26	16 34	17 43	18 53
40	6 09	4 40	15 19	16 30	17 43	18 57
45	6 11	4 35	15 10	16 26	17 42	19 01
50	6 14	4 28	14 59	16 20	17 42	19 06
52	6 16	4 25	14 54	16 17	17 42	19 08
54	6 17	4 21	14 49	16 15	17 42	19 11
56	6 19	4 16	14 43	16 11	17 42	19 14
58	6 21	4 11	14 36	16 08	17 41	19 17
60	6 23	4 05	14 28	16 04	17 41	19 20
S						

Lat.	Sunset	Twlt. ends	Moonset 10	11	12	13
N °	h m	h m	h m	h m	h m	h m
72	19 04	////	26 05	2 05	4 26	6 43
70	18 57	////	0 04	2 23	4 32	6 39
68	18 51	////	0 33	2 37	4 37	6 36
66	18 46	22 35	0 55	2 49	4 41	6 33
64	18 42	21 58	1 12	2 58	4 44	6 31
62	18 38	21 32	1 26	3 06	4 47	6 29
60	18 35	21 13	1 38	3 13	4 50	6 28
58	18 32	20 58	1 48	3 19	4 52	6 26
56	18 30	20 46	1 57	3 24	4 54	6 25
54	18 27	20 34	2 04	3 29	4 56	6 24
52	18 25	20 25	2 11	3 33	4 57	6 23
50	18 24	20 18	2 18	3 37	4 59	6 22
45	18 20	20 02	2 31	3 46	5 02	6 19
40	18 16	19 49	2 42	3 53	5 05	6 18
35	18 13	19 39	2 51	3 58	5 07	6 16
30	18 11	19 32	3 00	4 04	5 09	6 15
20	18 07	19 21	3 14	4 13	5 12	6 13
10	18 03	19 13	3 26	4 20	5 15	6 11
0	18 00	19 09	3 37	4 28	5 18	6 09
10	17 57	19 07	3 48	4 35	5 21	6 07
20	17 54	19 07	4 00	4 42	5 23	6 05
30	17 50	19 09	4 14	4 51	5 27	6 02
35	17 48	19 12	4 21	4 56	5 28	6 01
40	17 46	19 16	4 30	5 01	5 30	5 59
45	17 43	19 21	4 40	5 08	5 33	5 57
50	17 40	19 28	4 53	5 15	5 35	5 55
52	17 39	19 32	4 59	5 19	5 37	5 54
54	17 37	19 35	5 05	5 22	5 38	5 53
56	17 36	19 41	5 12	5 27	5 40	5 52
58	17 34	19 46	5 20	5 31	5 41	5 51
60	17 32	19 53	5 28	5 36	5 43	5 49
S						

GMT	Equation of Time (App.—Mean) 10	11	12
h	m s	m s	m s
0	+ 2 43.1	+ 3 04.0	+ 3 25.1
6	+ 2 48.3	+ 3 09.3	+ 3 30.3
12	+ 2 53.6	+ 3 14.5	+ 3 35.6
18	+ 2 58.8	+ 3 19.8	+ 3 40.9
24	+ 3 04.0	+ 3 25.1	+ 3 46.2

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
10	22 16	14 44	19 14	8 26	15 01
11	23 06	14 44	19 12	8 22	14 58
12	23 56	14 43	19 10	8 19	14 54
13	24 48	14 43	19 08	8 16	14 50

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.2	0.2	0.2
30	0.2	0.2	0.2
45	0.2	0.1	0.1
60	0.2	0.1	0.1
75	0.2	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	10	11	12
°	′	′	′
0	17.3	18.3	19.2
4	17.3	18.3	19.2
8	17.3	18.3	19.2
12	17.3	18.3	19.2
16	17.3	18.2	19.1
20	17.2	18.2	19.0
24	17.2	18.1	18.9
28	17.1	18.1	18.9
32	17.1	18.0	18.7
36	17.0	17.9	18.6
40	17.0	17.8	18.5
44	16.9	17.7	18.4
48	16.8	17.6	18.2
52	16.8	17.4	18.0
56	16.7	17.3	17.9
60	16.6	17.2	17.7
64	16.5	17.0	17.5
68	16.4	16.9	17.3
72	16.3	16.8	17.1
76	16.2	16.6	16.9
80	16.1	16.5	16.7
84	16.0	16.3	16.5
88	16.0	16.2	16.4
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	10	11	12
°	′	′	′
0	14.5	14.0	13.4
4	14.5	14.0	13.5
8	14.6	14.0	13.5
12	14.6	14.0	13.5
16	14.6	14.1	13.6
20	14.6	14.1	13.7
24	14.7	14.2	13.7
28	14.7	14.2	13.8
32	14.8	14.3	13.9
36	14.8	14.4	14.1
40	14.9	14.5	14.2
44	15.0	14.6	14.3
48	15.0	14.7	14.5
52	15.1	14.9	14.6
56	15.2	15.0	14.8
60	15.3	15.1	15.0
64	15.4	15.3	15.2
68	15.5	15.4	15.3
72	15.5	15.5	15.5
76	15.6	15.7	15.7
80	15.7	15.8	15.9
84	15.8	16.0	16.1
88	15.9	16.1	16.3
90			

Subtract from table, back cover

Full Moon 12

GMT	♈ GHA	VENUS −4.1 GHA	VENUS Dec.	MARS −0.7 GHA	MARS Dec.	JUPITER −1.6 GHA	JUPITER Dec.	SATURN 0.9 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
13 0	351 27.0	139 14.2	−16 28.7	72 37.1	−26 55.6	235 44.2	+21 26.4	136 51.2	−11 28.6	0 51.9	102	+ 1 04.3	+155
1	6 29.5	154 14.5	29.7	87 38.2	55.4	250 46.2	26.3	151 53.4	28.7	15 21.1	102	1 19.8	+155
2	21 32.0	169 14.8	30.8	102 39.3	55.3	265 48.2	26.2	166 55.7	28.7	29 50.3	101	1 35.3	+155
3	36 34.4	184 15.1	·· 31.8	117 40.5	·· 55.1	280 50.2	·· 26.2	181 57.9	·· 28.8	44 19.4	101	· 1 50.8	+155
4	51 36.9	199 15.4	32.8	132 41.6	54.9	295 52.2	26.1	197 00.1	28.9	58 48.5	101	2 06.3	+154
5	66 39.4	214 15.8	33.8	147 42.7	54.8	310 54.2	26.0	212 02.4	29.0	73 17.6	101	2 21.7	+155
6	81 41.8	229 16.1	−16 34.8	162 43.9	−26 54.6	325 56.3	+21 26.0	227 04.6	−11 29.1	87 46.7	100	+ 2 37.2	+155
7	96 44.3	244 16.4	35.8	177 45.0	54.5	340 58.3	25.9	242 06.9	29.2	102 15.7	100	2 52.7	+154
8	111 46.8	259 16.7	36.8	192 46.1	54.3	356 00.3	25.8	257 09.1	29.3	116 44.7	100	3 08.1	+155
9	126 49.2	274 17.0	·· 37.8	207 47.2	·· 54.2	11 02.3	·· 25.8	272 11.3	·· 29.3	131 13.7	99	· 3 23.6	+154
10	141 51.7	289 17.4	38.8	222 48.4	54.0	26 04.3	25.7	287 13.6	29.4	145 42.6	99	3 39.0	+154
11	156 54.2	304 17.7	39.8	237 49.5	53.9	41 06.4	25.6	302 15.8	29.5	160 11.5	98	3 54.4	+154
12	171 56.6	319 18.0	−16 40.8	252 50.6	−26 53.7	56 08.4	+21 25.5	317 18.1	−11 29.6	174 40.3	98	+ 4 09.8	+154
13	186 59.1	334 18.3	41.8	267 51.7	53.5	71 10.4	25.5	332 20.3	29.7	189 09.1	98	4 25.2	+154
14	202 01.5	349 18.7	42.8	282 52.9	53.4	86 12.4	25.4	347 22.5	29.8	203 37.9	97	4 40.6	+153
15	217 04.0	4 19.0	·· 43.8	297 54.0	·· 53.2	101 14.4	·· 25.3	2 24.8	·· 29.8	218 06.6	97	· 4 55.9	+154
16	232 06.5	19 19.3	44.8	312 55.1	53.1	116 16.4	25.3	17 27.0	29.9	232 35.3	97	5 11.3	+153
17	247 08.9	34 19.6	45.8	327 56.2	52.9	131 18.5	25.2	32 29.2	30.0	247 04.0	96	5 26.6	+152
18	262 11.4	49 20.0	−16 46.8	342 57.3	−26 52.8	146 20.5	+21 25.1	47 31.5	−11 30.1	261 32.6	96	+ 5 41.8	+153
19	277 13.9	64 20.3	47.8	357 58.5	52.6	161 22.5	25.1	62 33.7	30.2	276 01.2	95	5 57.1	+152
20	292 16.3	79 20.6	48.8	12 59.6	52.4	176 24.5	25.0	77 35.9	30.3	290 29.7	95	6 12.3	+152
21	307 18.8	94 20.9	·· 49.8	28 00.7	·· 52.3	191 26.5	·· 24.9	92 38.2	·· 30.4	304 58.2	95	· 6 27.5	+151
22	322 21.3	109 21.3	50.8	43 01.8	52.1	206 28.6	24.9	107 40.4	30.4	319 26.7	94	6 42.6	+151
23	337 23.7	124 21.6	51.8	58 02.9	52.0	221 30.6	24.8	122 42.7	30.5	333 55.1	93	6 57.7	+151
14 0	352 26.2	139 21.9	−16 52.8	73 04.0	−26 51.8	236 32.6	+21 24.7	137 44.9	−11 30.6	348 23.4	93	+ 7 12.8	+151
1	7 28.6	154 22.3	53.8	88 05.2	51.6	251 34.6	24.7	152 47.1	30.7	2 51.7	93	7 27.9	+150
2	22 31.1	169 22.6	54.8	103 06.3	51.5	266 36.7	24.6	167 49.4	30.8	17 20.0	92	7 42.9	+149
3	37 33.6	184 22.9	·· 55.8	118 07.4	·· 51.3	281 38.7	·· 24.5	182 51.6	·· 30.9	31 48.2	91	· 7 57.8	+149
4	52 36.0	199 23.3	56.8	133 08.5	51.2	296 40.7	24.5	197 53.8	30.9	46 16.3	92	8 12.7	+149
5	67 38.5	214 23.6	57.8	148 09.6	51.0	311 42.7	24.4	212 56.1	31.0	60 44.5	90	8 27.6	+148
6	82 41.0	229 23.9	−16 58.8	163 10.7	−26 50.8	326 44.7	+21 24.3	227 58.3	−11 31.1	75 12.5	90	+ 8 42.4	+148
7	97 43.4	244 24.3	16 59.8	178 11.8	50.7	341 46.8	24.3	243 00.5	31.2	89 40.5	90	8 57.2	+147
8	112 45.9	259 24.6	17 00.8	193 12.9	50.5	356 48.8	24.2	258 02.8	31.3	104 08.5	89	9 11.9	+147
9	127 48.4	274 24.9	·· 01.8	208 14.0	·· 50.4	11 50.8	·· 24.1	273 05.0	·· 31.4	118 36.4	89	· 9 26.6	+146
10	142 50.8	289 25.3	02.8	223 15.2	50.2	26 52.8	24.1	288 07.3	31.5	133 04.3	87	9 41.2	+145
11	157 53.3	304 25.6	03.7	238 16.3	50.0	41 54.9	24.0	303 09.5	31.5	147 32.0	88	9 55.7	+145
12	172 55.8	319 25.9	−17 04.7	253 17.4	−26 49.9	56 56.9	+21 23.9	318 11.7	−11 31.6	161 59.8	87	+10 10.2	+144
13	187 58.2	334 26.3	05.7	268 18.5	49.7	71 58.9	23.9	333 14.0	31.7	176 27.5	86	10 24.6	+144
14	203 00.7	349 26.6	06.7	283 19.6	49.5	87 00.9	23.8	348 16.2	31.8	190 55.1	86	10 39.0	+143
15	218 03.1	4 27.0	·· 07.7	298 20.7	·· 49.4	102 03.0	·· 23.7	3 18.4	·· 31.9	205 22.7	85	·10 53.3	+143
16	233 05.6	19 27.3	08.7	313 21.8	49.2	117 05.0	23.6	18 20.7	32.0	219 50.2	85	11 07.6	+141
17	248 08.1	34 27.6	09.7	328 22.9	49.0	132 07.0	23.6	33 22.9	32.1	234 17.7	84	11 21.7	+141
18	263 10.5	49 28.0	−17 10.7	343 24.0	−26 48.9	147 09.0	+21 23.5	48 25.1	−11 32.1	248 45.1	83	+11 35.8	+141
19	278 13.0	64 28.3	11.6	358 25.1	48.7	162 11.0	23.4	63 27.4	32.2	263 12.4	83	11 49.9	+139
20	293 15.5	79 28.7	12.6	13 26.2	48.6	177 13.1	23.4	78 29.6	32.3	277 39.7	83	12 03.8	+139
21	308 17.9	94 29.0	·· 13.6	28 27.3	·· 48.4	192 15.1	·· 23.3	93 31.8	·· 32.4	292 07.0	81	·12 17.7	+138
22	323 20.4	109 29.3	14.6	43 28.4	48.2	207 17.1	23.2	108 34.1	32.5	306 34.1	82	12 31.5	+138
23	338 22.9	124 29.7	15.6	58 29.5	48.1	222 19.1	23.2	123 36.3	32.6	321 01.3	80	12 45.3	+136
15 0	353 25.3	139 30.0	−17 16.6	73 30.6	−26 47.9	237 21.2	+21 23.1	138 38.5	−11 32.6	335 28.3	80	+12 58.9	+136
1	8 27.8	154 30.4	17.5	88 31.7	47.7	252 23.2	23.0	153 40.8	32.7	349 55.3	79	13 12.5	+135
2	23 30.2	169 30.7	18.5	103 32.8	47.6	267 25.2	23.0	168 43.0	32.8	4 22.2	79	13 26.0	+134
3	38 32.7	184 31.1	·· 19.5	118 33.9	·· 47.4	282 27.3	·· 22.9	183 45.2	·· 32.9	18 49.1	78	·13 39.4	+133
4	53 35.2	199 31.4	20.5	133 35.0	47.2	297 29.3	22.8	198 47.5	33.0	33 15.9	78	13 52.7	+132
5	68 37.6	214 31.8	21.5	148 36.1	47.1	312 31.3	22.8	213 49.7	33.1	47 42.7	76	14 05.9	+131
6	83 40.1	229 32.1	−17 22.4	163 37.2	−26 46.9	327 33.3	+21 22.7	228 51.9	−11 33.2	62 09.3	77	+14 19.0	+131
7	98 42.6	244 32.5	23.4	178 38.3	46.7	342 35.4	22.6	243 54.2	33.2	76 36.0	75	14 32.1	+129
8	113 45.0	259 32.8	24.4	193 39.4	46.6	357 37.4	22.6	258 56.4	33.3	91 02.5	75	14 45.0	+129
9	128 47.5	274 33.2	·· 25.4	208 40.5	·· 46.4	12 39.4	·· 22.5	273 58.6	·· 33.4	105 29.0	75	·14 57.9	+127
10	143 50.0	289 33.5	26.3	223 41.6	46.2	27 41.4	22.4	289 00.9	33.5	119 55.5	73	15 10.6	+127
11	158 52.4	304 33.9	27.3	238 42.7	46.1	42 43.5	22.4	304 03.1	33.6	134 21.8	73	15 23.3	+125
12	173 54.9	319 34.2	−17 28.3	253 43.7	−26 45.9	57 45.5	+21 22.3	319 05.3	−11 33.7	148 48.1	73	+15 35.8	+125
13	188 57.4	334 34.6	29.3	268 44.8	45.7	72 47.5	22.2	334 07.6	33.8	163 14.4	72	15 48.3	+123
14	203 59.8	349 34.9	30.2	283 45.9	45.6	87 49.6	22.2	349 09.8	33.8	177 40.6	71	16 00.6	+122
15	219 02.3	4 35.3	·· 31.2	298 47.0	·· 45.4	102 51.6	·· 22.1	4 12.0	·· 33.9	192 06.7	71	·16 12.8	+122
16	234 04.7	19 35.6	32.2	313 48.1	45.2	117 53.6	22.0	19 14.3	34.0	206 32.8	70	16 25.0	+120
17	249 07.2	34 36.0	33.1	328 49.2	45.1	132 55.6	22.0	34 16.5	34.1	220 58.8	69	16 37.0	+119
18	264 09.7	49 36.3	−17 34.1	343 50.3	−26 44.9	147 57.7	+21 21.9	49 18.7	−11 34.2	235 24.7	69	+16 48.9	+118
19	279 12.1	64 36.7	35.1	358 51.4	44.7	162 59.7	21.8	64 21.0	34.3	249 50.6	68	17 00.7	+117
20	294 14.6	79 37.1	36.1	13 52.5	44.5	178 01.7	21.8	79 23.2	34.4	264 16.4	67	17 12.4	+116
21	309 17.1	94 37.4	·· 37.0	28 53.5	·· 44.4	193 03.8	·· 21.7	94 25.4	·· 34.4	278 42.1	67	·17 24.0	+114
22	324 19.5	109 37.8	38.0	43 54.6	44.2	208 05.8	21.6	109 27.7	34.5	293 07.8	66	17 35.4	+113
23	339 22.0	124 38.1	39.0	58 55.7	44.0	223 07.8	21.6	124 29.9	34.6	307 33.4	66	17 46.7	+113
24	354 24.5	139 38.5	−17 39.9	73 56.8	−26 43.9	238 09.8	+21 21.5	139 32.1	−11 34.7	321 59.0	65	+17 58.0	+110
code	—	+ 4	− 10	+ 11	+ 2	+ 20	0	+ 23	− 1				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
13 0	180 56.7	+ 4 05.4
1	195 56.9	04.5
2	210 57.1	03.5
3	225 57.3	•• 02.6
4	240 57.5	01.6
5	255 57.8	4 00.7
6	270 58.0	+ 3 59.7
7	285 58.2	58.8
8	300 58.4	57.8
9	315 58.7	•• 56.8
10	330 58.9	55.9
11	345 59.1	54.9
12	0 59.3	+ 3 54.0
13	15 59.5	53.0
14	30 59.8	52.1
15	46 00.0	•• 51.1
16	61 00.2	50.2
17	76 00.4	49.2
18	91 00.6	+ 3 48.2
19	106 00.9	47.3
20	121 01.1	46.3
21	136 01.3	•• 45.4
22	151 01.5	44.4
23	166 01.7	43.5
14 0	181 02.0	+ 3 42.5
1	196 02.2	41.5
2	211 02.4	40.6
3	226 02.6	•• 39.6
4	241 02.9	38.7
5	256 03.1	37.7
6	271 03.3	+ 3 36.8
7	286 03.5	35.8
8	301 03.7	34.8
9	316 04.0	•• 33.9
10	331 04.2	32.9
11	346 04.4	32.0
12	1 04.6	+ 3 31.0
13	16 04.9	30.0
14	31 05.1	29.1
15	46 05.3	•• 28.1
16	61 05.5	27.2
17	76 05.7	26.2
18	91 06.0	+ 3 25.2
19	106 06.2	24.3
20	121 06.4	23.3
21	136 06.6	•• 22.4
22	151 06.9	21.4
23	166 07.1	20.4
15 0	181 07.3	+ 3 19.5
1	196 07.5	18.5
2	211 07.7	17.6
3	226 08.0	•• 16.6
4	241 08.2	15.6
5	256 08.4	14.7
6	271 08.6	+ 3 13.7
7	286 08.9	12.8
8	301 09.1	11.8
9	316 09.3	•• 10.8
10	331 09.5	09.9
11	346 09.7	08.9
12	1 10.0	+ 3 08.0
13	16 10.2	07.0
14	31 10.4	06.0
15	46 10.6	•• 05.1
16	61 10.9	04.1
17	76 11.1	03.1
18	91 11.3	+ 3 02.2
19	106 11.5	01.2
20	121 11.7	3 00.3
21	136 12.0	• 2 59.3
22	151 12.2	58.3
23	166 12.4	57.4
24	181 12.6	+ 2 56.4
code	—	− 10

STARS

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.4	−40 28.7
5	Achernar	335 58.8	−57 27.6
30	Acrux	173 59.4	−62 51.0
19	Adhara	255 47.3	−28 54.3
10	Aldebaran	291 39.9	+16 25.3
32	Alioth	166 59.6	+56 12.4
34	Alkaid	153 33.8	+49 32.4
55	Al Na'ir	28 38.4	−47 10.8
15	Alnilam	276 31.1	− 1 13.6
25	Alphard	218 39.6	− 8 27.6
41	Alphecca	126 48.4	+26 52.1
1	Alpheratz	358 28.8	+28 50.6
51	Altair	62 51.0	+ 8 45.0
2	Ankaa	353 58.6	−42 32.8
42	Antares	113 20.4	−26 20.1
37	Arcturus	146 36.1	+19 25.1
43	Atria	109 01.9	−68 57.2
22	Avior	234 36.6	−59 21.6
13	Bellatrix	279 19.2	+ 6 18.8
16	Betelg'se	271 49.0	+ 7 24.2
17	Canopus	264 15.8	−52 39.9
12	Capella	281 39.5	+45 57.2
53	Deneb	50 01.2	+45 07.3
28	Denebola	183 18.8	+14 49.5
4	Diphda	349 39.7	−18 13.8
27	Dubhe	194 46.1	+61 59.7
14	Elnath	279 08.3	+28 34.3
47	Eltanin	91 06.5	+51 29.9
54	Enif	34 30.1	+ 9 40.2
56	Fomalhaut	16 12.1	−29 51.6
31	Gacrux	172 50.7	−56 51.7
29	Gienah	176 38.0	−17 17.4
35	Hadar	149 51.1	−60 09.6
6	Hamal	328 50.3	+23 15.1
48	Kaus Aust.	84 42.1	−34 24.6
40	Kochab	137 18.4	+74 20.6
57	Markab	14 21.9	+14 57.9
8	Menkar	315 00.9	+ 3 55.0
36	Menkent	148 59.9	−36 09.0
24	Miapl'dus	221 50.1	−69 31.7
9	Mirfak	309 43.3	+49 42.1
50	Nunki	76 52.7	−26 21.3
52	Peacock	54 28.0	−56 53.0
21	Pollux	244 21.7	+28 08.2
20	Procyon	245 45.9	+ 5 20.6
46	R'alhague	96 47.3	+12 35.6
26	Regulus	208 30.6	+12 11.4
11	Rigel	281 54.4	− 8 14.9
38	Rigil Kent.	140 52.6	−60 39.3
44	Sabik	103 03.1	−15 40.3
3	Schedar	350 30.4	+56 17.5
45	Shaula	97 21.7	−37 04.5
18	Sirius	259 12.6	−16 38.9
33	Spica	159 18.0	−10 55.5
23	Suhail	223 25.3	−43 14.8
49	Vega	81 08.7	+38 44.7
39	Zub'g'bl	137 54.4	−15 51.3

Lat.	Sunrise	Twlt. begins	Moonrise 13	14	15	16
N °	h m	h m	h m	h m	h m	h m
72	5 00	////	17 25	16 53	15 59	▭
70	5 06	////	17 33	17 11	16 40	▭
68	5 11	0 33	17 39	17 25	17 08	16 37
66	5 15	1 34	17 44	17 37	17 30	17 21
64	5 19	2 06	17 48	17 47	17 47	17 50
62	5 22	2 29	17 52	17 56	18 02	18 12
60	5 24	2 47	17 55	18 03	18 14	18 30
58	5 26	3 00	17 58	18 10	18 25	18 45
56	5 28	3 12	18 01	18 16	18 34	18 58
54	5 30	3 22	18 04	18 21	18 42	19 10
52	5 32	3 31	18 06	18 26	18 50	19 20
50	5 33	3 39	18 08	18 30	18 56	19 29
45	5 37	3 54	18 12	18 39	19 11	19 48
40	5 39	4 06	18 16	18 47	19 23	20 04
35	5 42	4 15	18 19	18 54	19 33	20 17
30	5 44	4 22	18 22	19 00	19 42	20 29
20	5 47	4 33	18 27	19 11	19 58	20 49
10	5 50	4 40	18 32	19 20	20 12	21 06
0	5 52	4 44	18 36	19 29	20 25	21 23
10	5 55	4 46	18 40	19 38	20 38	21 39
20	5 57	4 45	18 45	19 47	20 52	21 57
30	6 00	4 43	18 50	19 58	21 08	22 18
35	6 02	4 39	18 53	20 05	21 18	22 30
40	6 03	4 35	18 57	20 12	21 29	22 44
45	6 05	4 29	19 01	20 21	21 42	23 01
50	6 08	4 22	19 06	20 31	21 57	23 21
52	6 09	4 18	19 08	20 36	22 05	23 31
54	6 10	4 13	19 11	20 42	22 13	23 42
56	6 11	4 09	19 14	20 48	22 23	23 55
58	6 12	4 02	19 17	20 54	22 33	24 10
60	6 14	3 56	19 20	21 02	22 46	24 27
S						

Lat.	Sunset	Twlt. ends	Moonset 13	14	15	16
N °	h m	h m	h m	h m	h m	h m
72	18 48	////	6 43	9 07	11 57	▭
70	18 43	////	6 39	8 51	11 18	▭
68	18 38	22 59	6 36	8 39	10 51	13 23
66	18 34	22 08	6 33	8 29	10 31	12 41
64	18 31	21 38	6 31	8 21	10 15	12 12
62	18 28	21 16	6 29	8 14	10 01	11 50
60	18 26	21 00	6 28	8 08	9 50	11 33
58	18 24	20 47	6 26	8 02	9 40	11 19
56	18 22	20 35	6 25	7 58	9 32	11 06
54	18 20	20 25	6 24	7 53	9 25	10 55
52	18 18	20 16	6 23	7 50	9 18	10 46
50	18 17	20 10	6 22	7 46	9 12	10 37
45	18 14	19 55	6 19	7 39	8 59	10 19
40	18 11	19 43	6 18	7 32	8 48	10 05
35	18 09	19 35	6 16	7 27	8 39	9 52
30	18 07	19 27	6 15	7 22	8 31	9 41
20	18 04	19 18	6 13	7 14	8 18	9 23
10	18 01	19 11	6 11	7 07	8 06	9 07
0	17 59	19 08	6 09	7 01	7 55	8 52
10	17 57	19 07	6 07	6 54	7 44	8 37
20	17 54	19 07	6 05	6 47	7 32	8 21
30	17 52	19 12	6 02	6 39	7 19	8 03
35	17 50	19 14	6 01	6 35	7 11	7 52
40	17 49	19 19	5 59	6 29	7 02	7 40
45	17 47	19 25	5 57	6 23	6 52	7 26
50	17 45	19 33	5 55	6 16	6 40	7 09
52	17 44	19 37	5 54	6 13	6 34	7 01
54	17 43	19 42	5 53	6 09	6 28	6 52
56	17 42	19 47	5 52	6 05	6 21	6 42
58	17 40	19 53	5 51	6 01	6 14	6 31
60	17 39	20 01	5 49	5 56	6 05	6 18
S						

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.2	0.2	0.2
30	0.2	0.2	0.2
45	0.2	0.1	0.1
60	0.2	0.1	0.1
75	0.2	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	13	14	15
°	′	′	′
0	19.7	20.0	20.0
4	19.7	20.0	20.0
8	19.7	20.0	20.0
12	19.7	19.9	19.9
16	19.6	19.8	19.8
20	19.5	19.8	19.8
24	19.4	19.6	19.6
28	19.3	19.5	19.5
32	19.2	19.4	19.4
36	19.1	19.3	19.3
40	18.9	19.1	19.1
44	18.7	18.9	18.9
48	18.6	18.8	18.8
52	18.4	18.6	18.6
56	18.2	18.4	18.4
60	18.0	18.1	18.1
64	17.8	17.9	17.9
68	17.6	17.7	17.7
72	17.4	17.5	17.5
76	17.1	17.2	17.2
80	16.9	17.0	17.0
84	16.7	16.7	16.7
88	16.5	16.6	16.6
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	13	14	15
°	′	′	′
0	13.2	13.0	13.0
4	13.2	13.0	13.0
8	13.2	13.1	13.1
12	13.2	13.1	13.1
16	13.3	13.2	13.2
20	13.4	13.3	13.3
24	13.5	13.4	13.4
28	13.6	13.5	13.5
32	13.7	13.6	13.6
36	13.8	13.7	13.7
40	14.0	13.9	13.9
44	14.2	14.1	14.1
48	14.3	14.3	14.3
52	14.5	14.4	14.4
56	14.7	14.6	14.6
60	14.9	14.9	14.9
64	15.1	15.1	15.1
68	15.3	15.3	15.3
72	15.5	15.5	15.5
76	15.8	15.8	15.8
80	16.0	16.0	16.0
84	16.2	16.3	16.3
88	16.4	16.4	16.4
90			

Subtract from table, back cover

Equation of Time (App.—Mean)

GMT	13	14	15
h	m s	m s	m s
0	+ 3 46.2	+ 4 07.4	+ 4 28.8
6	+ 3 51.5	+ 4 12.8	+ 4 34.1
12	+ 3 56.8	+ 4 18.1	+ 4 39.4
18	+ 4 02.1	+ 4 23.4	+ 4 44.8
24	+ 4 07.4	+ 4 28.8	+ 4 50.1

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
13	24 48	14 43	19 08	8 16	14 50
14	0 48	14 42	19 06	8 13	14 47
15	1 42	14 42	19 05	8 10	14 43
16	2 38	14 41	19 03	8 06	14 40

GMT		♈ GHA	VENUS −4.1 GHA	VENUS Dec.	MARS −0.7 GHA	MARS Dec.	JUPITER −1.6 GHA	JUPITER Dec.	SATURN 0.9 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
16	0	354 24.5	139 38.5	−17 39.9	73 56.8	−26 43.9	238 09.8	+21 21.5	139 32.1	−11 34.7	321 59.0	65	+17 58.0	+110
	1	9 26.9	154 38.9	40.9	88 57.9	43.7	253 11.9	21.4	154 34.4	34.8	336 24.5	64	18 09.0	+110
	2	24 29.4	169 39.2	41.9	103 59.0	43.5	268 13.9	21.4	169 36.6	34.9	350 49.9	64	18 20.0	+109
	3	39 31.8	184 39.6	•• 42.8	119 00.0	•• 43.3	283 15.9	•• 21.3	184 38.8	•• 35.0	5 15.3	63	·18 30.9	+107
	4	54 34.3	199 39.9	43.8	134 01.1	43.2	298 18.0	21.2	199 41.1	35.0	19 40.6	62	18 41.6	+106
	5	69 36.8	214 40.3	44.8	149 02.2	43.0	313 20.0	21.2	214 43.3	35.1	34 05.8	62	18 52.2	+104
	6	84 39.2	229 40.7	−17 45.7	164 03.3	−26 42.8	328 22.0	+21 21.1	229 45.5	−11 35.2	48 31.0	62	+19 02.6	+103
	7	99 41.7	244 41.0	46.7	179 04.4	42.7	343 24.1	21.0	244 47.7	35.3	62 56.2	61	19 12.9	+102
	8	114 44.2	259 41.4	47.6	194 05.4	42.5	358 26.1	21.0	259 50.0	35.4	77 21.3	60	19 23.1	+101
	9	129 46.6	274 41.8	•• 48.6	209 06.5	•• 42.3	13 28.1	•• 20.9	274 52.2	•• 35.5	91 46.3	60	·19 33.2	+ 99
	10	144 49.1	289 42.1	49.6	224 07.6	42.1	28 30.2	20.8	289 54.4	35.6	106 11.3	59	19 43.1	+ 98
	11	159 51.6	304 42.5	50.5	239 08.7	42.0	43 32.2	20.8	304 56.7	35.7	120 36.2	58	19 52.9	+ 97
	12	174 54.0	319 42.9	−17 51.5	254 09.8	−26 41.8	58 34.2	+21 20.7	319 58.9	−11 35.7	135 01.0	58	+20 02.6	+ 95
	13	189 56.5	334 43.2	52.4	269 10.8	41.6	73 36.3	20.6	335 01.1	35.8	149 25.8	58	20 12.1	+ 94
	14	204 59.0	349 43.6	53.4	284 11.9	41.4	88 38.3	20.6	350 03.4	35.9	163 50.6	57	20 21.5	+ 92
	15	220 01.4	4 44.0	•• 54.4	299 13.0	•• 41.3	103 40.3	•• 20.5	5 05.6	•• 36.0	178 15.3	56	·20 30.7	+ 91
	16	235 03.9	19 44.3	55.3	314 14.1	41.1	118 42.4	20.4	20 07.8	36.1	192 39.9	56	20 39.8	+ 90
	17	250 06.3	34 44.7	56.3	329 15.1	40.9	133 44.4	20.4	35 10.1	36.2	207 04.5	55	20 48.8	+ 88
	18	265 08.8	49 45.1	−17 57.2	344 16.2	−26 40.7	148 46.4	+21 20.3	50 12.3	−11 36.3	221 29.0	55	+20 57.6	+ 86
	19	280 11.3	64 45.5	58.2	359 17.3	40.6	163 48.5	20.2	65 14.5	36.3	235 53.5	54	21 06.2	+ 86
	20	295 13.7	79 45.8	17 59.1	14 18.3	40.4	178 50.5	20.2	80 16.7	36.4	250 17.9	54	21 14.8	+ 83
	21	310 16.2	94 46.2	·18 00.1	29 19.4	•• 40.2	193 52.5	•• 20.1	95 19.0	•• 36.5	264 42.3	54	·21 23.1	+ 82
	22	325 18.7	109 46.6	01.0	44 20.5	40.0	208 54.6	20.0	110 21.2	36.6	279 06.7	53	21 31.3	+ 81
	23	340 21.1	124 47.0	02.0	59 21.6	39.9	223 56.6	20.0	125 23.4	36.7	293 31.0	52	21 39.4	+ 79
17	0	355 23.6	139 47.3	−18 02.9	74 22.6	−26 39.7	238 58.6	+21 19.9	140 25.7	−11 36.8	307 55.2	53	+21 47.3	+ 78
	1	10 26.1	154 47.7	03.9	89 23.7	39.5	254 00.7	19.8	155 27.9	36.9	322 19.5	51	21 55.1	+ 76
	2	25 28.5	169 48.1	04.8	104 24.8	39.3	269 02.7	19.8	170 30.1	36.9	336 43.6	52	22 02.7	+ 75
	3	40 31.0	184 48.5	•• 05.8	119 25.8	•• 39.2	284 04.7	•• 19.7	185 32.4	•• 37.0	351 07.8	50	·22 10.2	+ 73
	4	55 33.5	199 48.8	06.7	134 26.9	39.0	299 06.8	19.6	200 34.6	37.1	5 31.8	51	22 17.5	+ 71
	5	70 35.9	214 49.2	07.7	149 28.0	38.8	314 08.8	19.6	215 36.8	37.2	19 55.9	50	22 24.6	+ 70
	6	85 38.4	229 49.6	−18 08.6	164 29.0	−26 38.6	329 10.9	+21 19.5	230 39.0	−11 37.3	34 19.9	50	+22 31.6	+ 68
	7	100 40.8	244 50.0	09.6	179 30.1	38.4	344 12.9	19.4	245 41.3	37.4	48 43.9	49	22 38.4	+ 67
	8	115 43.3	259 50.4	10.5	194 31.2	38.3	359 14.9	19.4	260 43.5	37.5	63 07.8	49	22 45.1	+ 65
	9	130 45.8	274 50.8	•• 11.5	209 32.2	•• 38.1	14 17.0	•• 19.3	275 45.7	•• 37.6	77 31.7	49	·22 51.6	+ 64
	10	145 48.2	289 51.1	12.4	224 33.3	37.9	29 19.0	19.2	290 48.0	37.6	91 55.6	49	22 58.0	+ 62
	11	160 50.7	304 51.5	13.4	239 34.3	37.7	44 21.0	19.2	305 50.2	37.7	106 19.5	48	23 04.2	+ 60
	12	175 53.2	319 51.9	−18 14.3	254 35.4	−26 37.5	59 23.1	+21 19.1	320 52.4	−11 37.8	120 43.3	48	+23 10.2	+ 59
	13	190 55.6	334 52.3	15.2	269 36.5	37.4	74 25.1	19.0	335 54.6	37.9	135 07.1	48	23 16.1	+ 57
	14	205 58.1	349 52.7	16.2	284 37.5	37.2	89 27.2	19.0	350 56.9	38.0	149 30.9	47	23 21.8	+ 55
	15	221 00.6	4 53.1	•• 17.1	299 38.6	•• 37.0	104 29.2	•• 18.9	5 59.1	•• 38.1	163 54.6	47	·23 27.3	+ 54
	16	236 03.0	19 53.5	18.1	314 39.7	36.8	119 31.2	18.8	21 01.3	38.2	178 18.3	47	23 32.7	+ 52
	17	251 05.5	34 53.8	19.0	329 40.7	36.6	134 33.3	18.8	36 03.6	38.2	192 42.0	47	23 37.9	+ 50
	18	266 08.0	49 54.2	−18 19.9	344 41.8	−26 36.5	149 35.3	+21 18.7	51 05.8	−11 38.3	207 05.7	47	+23 42.9	+ 49
	19	281 10.4	64 54.6	20.9	359 42.8	36.3	164 37.3	18.6	66 08.0	38.4	221 29.4	46	23 47.8	+ 47
	20	296 12.9	79 55.0	21.8	14 43.9	36.1	179 39.4	18.6	81 10.2	38.5	235 53.0	47	23 52.5	+ 46
	21	311 15.3	94 55.4	•• 22.8	29 44.9	•• 35.9	194 41.4	•• 18.5	96 12.5	•• 38.6	250 16.7	46	·23 57.1	+ 44
	22	326 17.8	109 55.8	23.7	44 46.0	35.7	209 43.5	18.4	111 14.7	38.7	264 40.3	46	24 01.5	+ 42
	23	341 20.3	124 56.2	24.6	59 47.1	35.5	224 45.5	18.4	126 16.9	38.8	279 03.9	46	24 05.7	+ 41
18	0	356 22.7	139 56.6	−18 25.6	74 48.1	−26 35.4	239 47.5	+21 18.3	141 19.1	−11 38.9	293 27.5	46	+24 09.8	+ 38
	1	11 25.2	154 57.0	26.5	89 49.2	35.2	254 49.6	18.2	156 21.4	38.9	307 51.1	46	24 13.6	+ 38
	2	26 27.7	169 57.4	27.4	104 50.2	35.0	269 51.6	18.2	171 23.6	39.0	322 14.7	46	24 17.4	+ 35
	3	41 30.1	184 57.8	•• 28.4	119 51.3	•• 34.8	284 53.7	•• 18.1	186 25.8	•• 39.1	336 38.3	46	·24 20.9	+ 34
	4	56 32.6	199 58.2	29.3	134 52.3	34.6	299 55.7	18.0	201 28.1	39.2	351 01.9	45	24 24.3	+ 32
	5	71 35.1	214 58.6	30.2	149 53.4	34.4	314 57.7	18.0	216 30.3	39.3	5 25.4	46	24 27.5	+ 30
	6	86 37.5	229 59.0	−18 31.2	164 54.4	−26 34.3	329 59.8	+21 17.9	231 32.5	−11 39.4	19 49.0	46	+24 30.5	+ 29
	7	101 40.0	244 59.4	32.1	179 55.5	34.1	345 01.8	17.8	246 34.7	39.5	34 12.6	46	24 33.4	+ 27
	8	116 42.4	259 59.8	33.0	194 56.5	33.9	0 03.9	17.8	261 37.0	39.6	48 36.2	46	24 36.1	+ 26
	9	131 44.9	275 00.2	•• 34.0	209 57.6	•• 33.7	15 05.9	•• 17.7	276 39.2	•• 39.6	62 59.8	46	·24 38.7	+ 23
	10	146 47.4	290 00.6	34.9	224 58.6	33.5	30 08.0	17.6	291 41.4	39.7	77 23.4	46	24 41.0	+ 22
	11	161 49.8	305 01.0	35.8	239 59.7	33.3	45 10.0	17.6	306 43.6	39.8	91 47.0	47	24 43.2	+ 21
	12	176 52.3	320 01.4	−18 36.7	255 00.7	−26 33.2	60 12.0	+21 17.5	321 45.9	−11 39.9	106 10.7	46	+24 45.3	+ 18
	13	191 54.8	335 01.8	37.7	270 01.8	33.0	75 14.1	17.4	336 48.1	40.0	120 34.3	47	24 47.1	+ 17
	14	206 57.2	350 02.2	38.6	285 02.8	32.8	90 16.1	17.4	351 50.3	40.1	134 58.0	47	24 48.8	+ 15
	15	221 59.7	5 02.6	•• 39.5	300 03.9	•• 32.6	105 18.2	•• 17.3	6 52.6	•• 40.2	149 21.7	47	·24 50.3	+ 14
	16	237 02.2	20 03.0	40.4	315 04.9	32.4	120 20.2	17.2	21 54.8	40.3	163 45.4	47	24 51.7	+ 12
	17	252 04.6	35 03.4	41.4	330 05.9	32.2	135 22.3	17.2	36 57.0	40.3	178 09.1	47	24 52.9	+ 10
	18	267 07.1	50 03.8	−18 42.3	345 07.0	−26 32.0	150 24.3	+21 17.1	51 59.2	−11 40.4	192 32.8	48	+24 53.9	+ 9
	19	282 09.6	65 04.2	43.2	0 08.0	31.8	165 26.3	17.0	67 01.5	40.5	206 56.6	48	24 54.8	+ 6
	20	297 12.0	80 04.6	44.1	15 09.1	31.7	180 28.4	17.0	82 03.7	40.6	221 20.4	48	24 55.4	+ 6
	21	312 14.5	95 05.0	•• 45.1	30 10.1	•• 31.5	195 30.4	•• 16.9	97 05.9	•• 40.7	235 44.2	49	·24 56.0	+ 3
	22	327 16.9	110 05.4	46.0	45 11.2	31.3	210 32.5	16.8	112 08.1	40.8	250 08.1	49	24 56.3	+ 2
	23	342 19.4	125 05.8	46.9	60 12.2	31.1	225 34.5	16.8	127 10.4	40.9	264 32.0	49	24 56.5	0
	24	357 21.9	140 06.2	−18 47.8	75 13.2	−26 30.9	240 36.6	+21 16.7	142 12.6	−11 40.9	278 55.9	49	+24 56.5	− 1
code		−	+ 4	− 9	+ 11	+ 1	+ 20	− 1	+ 22	− 1				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
16 0	181 12.6	+ 2 56.4
1	196 12.9	55.4
2	211 13.1	54.5
3	226 13.3	•• 53.5
4	241 13.5	52.6
5	256 13.7	51.6
6	271 14.0	+ 2 50.6
7	286 14.2	49.7
8	301 14.4	48.7
9	316 14.6	•• 47.7
10	331 14.9	46.8
11	346 15.1	45.8
12	1 15.3	+ 2 44.8
13	16 15.5	43.9
14	31 15.7	42.9
15	46 16.0	•• 42.0
16	61 16.2	41.0
17	76 16.4	40.0
18	91 16.6	+ 2 39.1
19	106 16.9	38.1
20	121 17.1	37.1
21	136 17.3	•• 36.2
22	151 17.5	35.2
23	166 17.8	34.2
17 0	181 18.0	+ 2 33.3
1	196 18.2	32.3
2	211 18.4	31.3
3	226 18.6	•• 30.4
4	241 18.9	29.4
5	256 19.1	28.4
6	271 19.3	+ 2 27.5
7	286 19.5	26.5
8	301 19.8	25.5
9	316 20.0	•• 24.6
10	331 20.2	23.6
11	346 20.4	22.7
12	1 20.7	+ 2 21.7
13	16 20.9	20.7
14	31 21.1	19.8
15	46 21.3	•• 18.8
16	61 21.5	17.8
17	76 21.8	16.9
18	91 22.0	+ 2 15.9
19	106 22.2	14.9
20	121 22.4	14.0
21	136 22.7	•• 13.0
22	151 22.9	12.0
23	166 23.1	11.1
18 0	181 23.3	+ 2 10.1
1	196 23.5	09.1
2	211 23.8	08.2
3	226 24.0	•• 07.2
4	241 24.2	06.2
5	256 24.4	05.2
6	271 24.7	+ 2 04.3
7	286 24.9	03.3
8	301 25.1	02.3
9	316 25.3	•• 01.4
10	331 25.5	2 00.4
11	346 25.8	1 59.4
12	1 26.0	+ 1 58.5
13	16 26.2	57.5
14	31 26.4	56.5
15	46 26.7	•• 55.6
16	61 26.9	54.6
17	76 27.1	53.6
18	91 27.3	+ 1 52.7
19	106 27.5	51.7
20	121 27.8	50.7
21	136 28.0	•• 49.8
22	151 28.2	48.8
23	166 28.4	47.8
24	181 28.7	+ 1 46.9
code	—	− 10

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.4	−40 28.7
5	Achernar	335 58.8	−57 27.6
30	Acrux	173 59.5	−62 51.0
19	Adhara	255 47.3	−28 54.3
10	Aldebaran	291 39.8	+16 25.3
32	Alioth	166 59.6	+56 12.4
34	Alkaid	153 33.8	+49 32.4
55	Al Na'ir	28 38.4	−47 10.8
15	Alnilam	276 31.0	− 1 13.6
25	Alphard	218 39.6	− 8 27.6
41	Alphecca	126 48.4	+26 52.1
1	Alpheratz	358 28.8	+28 50.6
51	Altair	62 51.0	+ 8 45.0
2	Ankaa	353 58.5	−42 32.8
42	Antares	113 20.4	−26 20.1
37	Arcturus	146 36.1	+19 25.1
43	Atria	109 01.9	−68 57.2
22	Avior	234 36.6	−59 21.5
13	Bellatrix	279 19.2	+ 6 18.8
16	Betelg'se	271 49.0	+ 7 24.2
17	Canopus	264 15.8	−52 39.9
12	Capella	281 39.5	+45 57.2
53	Deneb	50 01.2	+45 07.4
28	Denebola	183 18.8	+14 49.5
4	Diphda	349 39.7	−18 13.8
27	Dubhe	194 46.0	+61 59.7
14	Elnath	279 08.3	+28 34.3
47	Eltanin	91 06.6	+51 29.9
54	Enif	34 30.1	+ 9 40.2
56	Fomalhaut	16 12.1	−29 51.6
31	Gacrux	172 50.7	−56 51.7
29	Gienah	176 38.0	−17 17.4
35	Hadar	149 51.1	−60 09.5
6	Hamal	328 50.2	+23 15.1
48	Kaus Aust.	84 42.1	−34 24.6
40	Kochab	137 18.5	+74 20.6
57	Markab	14 21.9	+14 57.9
8	Menkar	315 00.9	+ 3 55.0
36	Menkent	148 59.9	−36 09.0
24	Miapl'dus	221 50.1	−69 31.7
9	Mirfak	309 43.2	+49 42.1
50	Nunki	76 52.7	−26 21.3
52	Peacock	54 28.0	−56 53.0
21	Pollux	244 21.7	+28 08.2
20	Procyon	245 45.9	+ 5 20.6
46	R'alhague	96 47.3	+12 35.6
26	Regulus	208 30.6	+12 11.4
11	Rigel	281 54.3	− 8 14.9
38	Rigil Kent.	140 52.6	−60 39.3
44	Sabik	103 03.1	−15 40.2
3	Schedar	350 30.4	+56 17.5
45	Shaula	97 21.7	−37 04.5
18	Sirius	259 12.6	−16 38.9
33	Spica	159 18.0	−10 55.5
23	Suhail	223 25.3	−43 14.8
49	Vega	81 08.7	+38 44.7
39	Zub'g'bi	137 54.4	−15 51.3

Lat.	Sunrise	Twlt. begins	Moonrise 16	17	18	19
N °	h m	h m	h m	h m	h m	h m
72	5 14	////	□	□	□	□
70	5 18	////	□	□	□	□
68	5 22	1 15	16 37	□	□	□
66	5 24	1 55	17 21	17 00	□	□
64	5 27	2 22	17 50	17 58	18 27	19 41
62	5 29	2 42	18 12	18 32	19 12	20 21
60	5 31	2 57	18 30	18 57	19 42	20 49
58	5 33	3 10	18 45	19 17	20 05	21 11
56	5 34	3 20	18 58	19 33	20 23	21 29
54	5 36	3 30	19 10	19 47	20 39	21 44
52	5 37	3 38	19 20	20 00	20 52	21 57
50	5 38	3 44	19 29	20 11	21 04	22 08
45	5 40	3 59	19 48	20 34	21 28	22 32
40	5 42	4 09	20 04	20 52	21 48	22 51
35	5 44	4 18	20 17	21 08	22 04	23 06
30	5 45	4 25	20 29	21 21	22 19	23 20
20	5 48	4 33	20 49	21 44	22 43	23 44
10	5 50	4 40	21 06	22 04	23 04	24 04
0	5 51	4 43	21 23	22 23	23 23	24 23
10	5 53	4 44	21 39	22 42	23 43	24 41
20	5 55	4 43	21 57	23 02	24 04	0 04
30	5 56	4 38	22 18	23 26	24 29	0 29
35	5 57	4 35	22 30	23 39	24 43	0 43
40	5 58	4 30	22 44	23 55	24 59	0 59
45	6 00	4 24	23 01	24 15	0 15	1 19
50	6 01	4 14	23 21	24 39	0 39	1 44
52	6 02	4 10	23 31	24 50	0 50	1 56
54	6 02	4 06	23 42	25 03	1 03	2 10
56	6 03	4 00	23 55	25 19	1 19	2 26
58	6 04	3 53	24 10	0 10	1 37	2 45
60	6 05	3 46	24 27	0 27	1 59	3 08
S						

Lat.	Sunset	Twlt. ends	Moonset 16	17	18	19
N °	h m	h m	h m	h m	h m	h m
72	18 33	////	□	□	□	□
70	18 29	////	□	□	□	□
68	18 26	22 22	13 23	□	□	□
66	18 23	21 46	12 41	15 07	□	□
64	18 20	21 20	12 12	14 09	15 47	16 38
62	18 18	21 02	11 50	13 35	15 02	15 57
60	18 17	20 48	11 33	13 11	14 32	15 29
58	18 15	20 35	11 19	12 51	14 10	15 07
56	18 14	20 25	11 06	12 35	13 51	14 49
54	18 12	20 16	10 55	12 21	13 36	14 34
52	18 11	20 08	10 46	12 09	13 22	14 21
50	18 10	20 01	10 37	11 59	13 11	14 10
45	18 08	19 48	10 19	11 36	12 46	13 46
40	18 06	19 38	10 05	11 18	12 27	13 26
35	18 05	19 30	9 52	11 03	12 10	13 10
30	18 04	19 24	9 41	10 50	11 56	12 56
20	18 01	19 14	9 23	10 28	11 32	12 32
10	17 59	19 09	9 07	10 09	11 11	12 11
0	17 58	19 07	8 52	9 51	10 52	11 52
10	17 56	19 06	8 37	9 34	10 32	11 33
20	17 55	19 08	8 21	9 14	10 12	11 12
30	17 53	19 13	8 03	8 53	9 48	10 48
35	17 53	19 17	7 52	8 40	9 33	10 33
40	17 52	19 22	7 40	8 25	9 17	10 17
45	17 50	19 28	7 26	8 08	8 58	9 57
50	17 49	19 38	7 09	7 46	8 33	9 32
52	17 49	19 43	7 01	7 36	8 21	9 20
54	17 48	19 48	6 52	7 24	8 08	9 06
56	17 47	19 53	6 42	7 11	7 53	8 51
58	17 47	20 01	6 31	6 56	7 34	8 32
60	17 46	20 09	6 18	6 38	7 12	8 09
S						

G M T	Equation of Time (App.—Mean) 16	17	18
h	m s	m s	m s
0	+ 4 50.1	+ 5 11.5	+ 5 32.8
6	+ 4 55.4	+ 5 16.8	+ 5 38.2
12	+ 5 00.8	+ 5 22.2	+ 5 43.5
18	+ 5 06.1	+ 5 27.5	+ 5 48.8
24	+ 5 11.5	+ 5 32.8	+ 5 54.2

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
16	2 38	14 41	19 03	8 06	14 40
17	3 37	14 41	19 01	8 03	14 36
18	4 37	14 40	19 00	8 00	14 33
19	5 38	14 39	18 58	7 57	14 29

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.2	0.2	0.2
30			
	0.2	0.2	0.2
45			
	0.2	0.1	0.1
60			
	0.2	0.1	0.1
75			
	0.2	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	16	17	18
°	′	′	′
0			
	19.6	19.1	18.3
4			
	19.6	19.1	18.3
8			
	19.6	19.1	18.3
12			
	19.5	19.0	18.3
16			
	19.5	19.0	18.2
20			
	19.4	18.9	18.2
24			
	19.3	18.8	18.1
28			
	19.2	18.7	18.1
32			
	19.1	18.6	18.0
36			
	18.9	18.5	17.9
40			
	18.8	18.4	17.8
44			
	18.6	18.3	17.7
48			
	18.5	18.1	17.6
52			
	18.3	18.0	17.4
56			
	18.1	17.8	17.3
60			
	17.9	17.6	17.2
64			
	17.7	17.5	17.0
68			
	17.5	17.3	16.9
72			
	17.3	17.1	16.8
76			
	17.1	16.9	16.6
80			
	16.9	16.7	16.5
84			
	16.6	16.5	16.3
88			
	16.5	16.4	16.2
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	16	17	18
°	′	′	′
0			
	13.2	13.5	14.0
4			
	13.2	13.5	14.0
8			
	13.3	13.6	14.0
12			
	13.3	13.6	14.0
16			
	13.4	13.6	14.1
20			
	13.5	13.7	14.1
24			
	13.5	13.8	14.2
28			
	13.6	13.9	14.2
32			
	13.8	14.0	14.3
36			
	13.9	14.1	14.4
40			
	14.0	14.2	14.5
44			
	14.2	14.4	14.6
48			
	14.4	14.5	14.7
52			
	14.5	14.7	14.9
56			
	14.7	14.8	15.0
60			
	14.9	15.0	15.1
64			
	15.1	15.2	15.3
68			
	15.3	15.4	15.4
72			
	15.5	15.5	15.5
76			
	15.8	15.7	15.7
80			
	16.0	15.9	15.8
84			
	16.2	16.1	16.0
88			
	16.4	16.3	16.1
90			

Subtract from table, back cover

Day	GMT h	♈ GHA ° ′	VENUS −4.1 GHA ° ′	VENUS Dec. ° ′	MARS −0.6 GHA ° ′	MARS Dec. ° ′	JUPITER −1.6 GHA ° ′	JUPITER Dec. ° ′	SATURN 0.9 GHA ° ′	SATURN Dec. ° ′	MOON GHA ° ′	code	MOON Dec. ° ′	code
19	0	357 21.9	140 06.2	−18 47.8	75 13.2	−26 30.9	240 36.6	+21 16.7	142 12.6	−11 40.9	278 55.9	49	+24 56.5	− 2
	1	12 24.3	155 06.7	48.7	90 14.3	30.7	255 38.6	16.6	157 14.8	41.0	293 19.8	50	24 56.4	− 3
	2	27 26.8	170 07.1	49.6	105 15.3	30.5	270 40.7	16.6	172 17.0	41.1	307 43.8	51	24 56.1	− 5
	3	42 29.3	185 07.5	•• 50.6	120 16.4	•• 30.3	285 42.7	•• 16.5	187 19.3	•• 41.2	322 07.9	50	·24 55.6	− 6
	4	57 31.7	200 07.9	51.5	135 17.4	30.1	300 44.7	16.4	202 21.5	41.3	336 31.9	52	24 55.0	− 8
	5	72 34.2	215 08.3	52.4	150 18.4	30.0	315 46.8	16.4	217 23.7	41.4	350 56.1	51	24 54.2	− 10
	6	87 36.7	230 08.7	−18 53.3	165 19.5	−26 29.8	330 48.8	+21 16.3	232 25.9	−11 41.5	5 20.2	52	+24 53.2	− 11
	7	102 39.1	245 09.1	54.2	180 20.5	29.6	345 50.9	16.2	247 28.2	41.6	19 44.4	53	24 52.1	− 13
	8	117 41.6	260 09.6	55.1	195 21.5	29.4	0 52.9	16.2	262 30.4	41.7	34 08.7	53	24 50.8	− 14
	9	132 44.1	275 10.0	•• 56.0	210 22.6	•• 29.2	15 55.0	•• 16.1	277 32.6	•• 41.7	48 33.0	53	·24 49.4	− 16
	10	147 46.5	290 10.4	57.0	225 23.6	29.0	30 57.0	16.0	292 34.8	41.8	62 57.3	54	24 47.8	− 18
	11	162 49.0	305 10.8	57.9	240 24.6	28.8	45 59.1	16.0	307 37.1	41.9	77 21.7	55	24 46.0	− 19
	12	177 51.4	320 11.2	−18 58.8	255 25.7	−26 28.6	61 01.1	+21 15.9	322 39.3	−11 42.0	91 46.2	55	+24 44.1	− 21
	13	192 53.9	335 11.7	18 59.7	270 26.7	28.4	76 03.2	15.8	337 41.5	42.1	106 10.7	56	24 42.0	− 22
	14	207 56.4	350 12.1	19 00.6	285 27.7	28.2	91 05.2	15.8	352 43.7	42.2	120 35.3	56	24 39.8	− 24
	15	222 58.8	5 12.5	•• 01.5	300 28.8	•• 28.0	106 07.3	•• 15.7	7 46.0	•• 42.3	134 59.9	57	·24 37.4	− 26
	16	238 01.3	20 12.9	02.4	315 29.8	27.8	121 09.3	15.6	22 48.2	42.4	149 24.6	58	24 34.8	− 27
	17	253 03.8	35 13.4	03.3	330 30.8	27.6	136 11.4	15.6	37 50.4	42.4	163 49.4	58	24 32.1	− 28
	18	268 06.2	50 13.8	−19 04.2	345 31.9	−26 27.5	151 13.4	+21 15.5	52 52.6	−11 42.5	178 14.2	58	+24 29.3	− 30
	19	283 08.7	65 14.2	05.1	0 32.9	27.3	166 15.5	15.4	67 54.8	42.6	192 39.0	60	24 26.3	− 32
	20	298 11.2	80 14.6	06.0	15 33.9	27.1	181 17.5	15.4	82 57.1	42.7	207 04.0	60	24 23.1	− 33
	21	313 13.6	95 15.1	•• 07.0	30 35.0	•• 26.9	196 19.6	•• 15.3	97 59.3	•• 42.8	221 29.0	61	·24 19.8	− 35
	22	328 16.1	110 15.5	07.9	45 36.0	26.7	211 21.6	15.3	113 01.5	42.9	235 54.1	61	24 16.3	− 36
	23	343 18.6	125 15.9	08.8	60 37.0	26.5	226 23.7	15.2	128 03.7	43.0	250 19.2	62	24 12.7	− 37
20	0	358 21.0	140 16.3	−19 09.7	75 38.0	−26 26.3	241 25.7	+21 15.1	143 06.0	−11 43.1	264 44.4	63	+24 09.0	− 39
	1	13 23.5	155 16.8	10.6	90 39.1	26.1	256 27.8	15.1	158 08.2	43.1	279 09.7	64	24 05.1	− 41
	2	28 25.9	170 17.2	11.5	105 40.1	25.9	271 29.8	15.0	173 10.4	43.2	293 35.1	64	24 01.0	− 42
	3	43 28.4	185 17.6	•• 12.4	120 41.1	•• 25.7	286 31.9	•• 14.9	188 12.6	•• 43.3	308 00.5	65	·23 56.8	− 43
	4	58 30.9	200 18.1	13.3	135 42.1	25.5	301 33.9	14.9	203 14.9	43.4	322 26.0	66	23 52.5	− 45
	5	73 33.3	215 18.5	14.2	150 43.2	25.3	316 36.0	14.8	218 17.1	43.5	336 51.6	66	23 48.0	− 46
	6	88 35.8	230 18.9	−19 15.1	165 44.2	−26 25.1	331 38.0	+21 14.7	233 19.3	−11 43.6	351 17.2	68	+23 43.4	− 48
	7	103 38.3	245 19.4	16.0	180 45.2	24.9	346 40.1	14.7	248 21.5	43.7	5 43.0	68	23 38.6	− 49
	8	118 40.7	260 19.8	16.9	195 46.2	24.7	1 42.1	14.6	263 23.7	43.8	20 08.8	69	23 33.7	− 50
	9	133 43.2	275 20.3	•• 17.8	210 47.3	•• 24.5	16 44.2	•• 14.5	278 26.0	•• 43.8	34 34.7	69	·23 28.7	− 52
	10	148 45.7	290 20.7	18.6	225 48.3	24.3	31 46.2	14.5	293 28.2	43.9	49 00.6	71	23 23.5	− 53
	11	163 48.1	305 21.1	19.5	240 49.3	24.1	46 48.3	14.4	308 30.4	44.0	63 26.7	71	23 18.2	− 54
	12	178 50.6	320 21.6	−19 20.4	255 50.3	−26 23.9	61 50.3	+21 14.3	323 32.6	−11 44.1	77 52.8	72	+23 12.8	− 56
	13	193 53.0	335 22.0	21.3	270 51.3	23.7	76 52.4	14.3	338 34.9	44.2	92 19.0	73	23 07.2	− 57
	14	208 55.5	350 22.5	22.2	285 52.4	23.5	91 54.4	14.2	353 37.1	44.3	106 45.3	74	23 01.5	− 59
	15	223 58.0	5 22.9	•• 23.1	300 53.4	•• 23.3	106 56.5	•• 14.1	8 39.3	•• 44.4	121 11.7	75	·22 55.6	− 60
	16	239 00.4	20 23.3	24.0	315 54.4	23.1	121 58.5	14.1	23 41.5	44.5	135 38.2	75	22 49.6	− 61
	17	254 02.9	35 23.8	24.9	330 55.4	22.9	137 00.6	14.0	38 43.7	44.6	150 04.7	76	22 43.5	− 62
	18	269 05.4	50 24.2	−19 25.8	345 56.4	−26 22.7	152 02.6	+21 13.9	53 46.0	−11 44.6	164 31.3	78	+22 37.3	− 64
	19	284 07.8	65 24.7	26.7	0 57.4	22.5	167 04.7	13.9	68 48.2	44.7	178 58.1	78	22 30.9	− 64
	20	299 10.3	80 25.1	27.6	15 58.5	22.3	182 06.7	13.8	83 50.4	44.8	193 24.9	79	22 24.5	− 67
	21	314 12.8	95 25.6	•• 28.4	30 59.5	•• 22.1	197 08.8	•• 13.7	98 52.6	•• 44.9	207 51.8	79	·22 17.8	− 67
	22	329 15.2	110 26.0	29.3	46 00.5	21.9	212 10.9	13.7	113 54.8	45.0	222 18.7	81	22 11.1	− 68
	23	344 17.7	125 26.5	30.2	61 01.5	21.7	227 12.9	13.6	128 57.1	45.1	236 45.8	82	22 04.3	− 70
21	0	359 20.2	140 26.9	−19 31.1	76 02.5	−26 21.5	242 15.0	+21 13.6	143 59.3	−11 45.2	251 13.0	82	+21 57.3	− 71
	1	14 22.6	155 27.4	32.0	91 03.5	21.3	257 17.0	13.5	159 01.5	45.3	265 40.2	83	21 50.2	− 72
	2	29 25.1	170 27.8	32.9	106 04.5	21.1	272 19.1	13.4	174 03.7	45.3	280 07.5	85	21 43.0	− 73
	3	44 27.5	185 28.3	•• 33.8	121 05.5	•• 20.9	287 21.1	•• 13.4	189 06.0	•• 45.4	294 35.0	85	·21 35.7	− 75
	4	59 30.0	200 28.7	34.6	136 06.6	20.7	302 23.2	13.3	204 08.2	45.5	309 02.5	86	21 28.2	− 75
	5	74 32.5	215 29.2	35.5	151 07.6	20.5	317 25.2	13.2	219 10.4	45.6	323 30.1	87	21 20.7	− 77
	6	89 34.9	230 29.6	−19 36.4	166 08.6	−26 20.3	332 27.3	+21 13.2	234 12.6	−11 45.7	337 57.8	87	+21 13.0	− 78
	7	104 37.4	245 30.1	37.3	181 09.6	20.1	347 29.4	13.1	249 14.8	45.8	352 25.5	89	21 05.2	− 79
	8	119 39.9	260 30.6	38.2	196 10.6	19.9	2 31.4	13.0	264 17.1	45.9	6 53.4	90	20 57.3	− 80
	9	134 42.3	275 31.0	•• 39.0	211 11.6	•• 19.7	17 33.5	•• 13.0	279 19.3	•• 46.0	21 21.4	90	·20 49.3	− 81
	10	149 44.8	290 31.5	39.9	226 12.6	19.5	32 35.5	12.9	294 21.5	46.1	35 49.4	92	20 41.2	− 82
	11	164 47.3	305 31.9	40.8	241 13.6	19.3	47 37.6	12.8	309 23.7	46.1	50 17.6	92	20 33.0	− 83
	12	179 49.7	320 32.4	−19 41.7	256 14.6	−26 19.1	62 39.6	+21 12.8	324 25.9	−11 46.2	64 45.8	93	+20 24.7	− 85
	13	194 52.2	335 32.9	42.5	271 15.6	18.9	77 41.7	12.7	339 28.2	46.3	79 14.1	94	20 16.2	− 85
	14	209 54.7	350 33.3	43.4	286 16.6	18.7	92 43.8	12.6	354 30.4	46.4	93 42.5	95	20 07.7	− 86
	15	224 57.1	5 33.8	•• 44.3	301 17.6	•• 18.5	107 45.8	•• 12.6	9 32.6	•• 46.5	108 11.0	96	·19 59.1	− 88
	16	239 59.6	20 34.3	45.2	316 18.6	18.3	122 47.9	12.5	24 34.8	46.6	122 39.6	97	19 50.3	− 88
	17	255 02.0	35 34.7	46.0	331 19.6	18.1	137 49.9	12.4	39 37.0	46.7	137 08.3	98	19 41.5	− 89
	18	270 04.5	50 35.2	−19 46.9	346 20.7	−26 17.9	152 52.0	+21 12.4	54 39.3	−11 46.8	151 37.1	98	+19 32.6	− 90
	19	285 07.0	65 35.7	47.8	1 21.7	17.7	167 54.1	12.3	69 41.5	46.9	166 05.9	100	19 23.6	− 92
	20	300 09.4	80 36.1	48.7	16 22.7	17.4	182 56.1	12.3	84 43.7	46.9	180 34.9	100	19 14.4	− 92
	21	315 11.9	95 36.6	•• 49.5	31 23.7	•• 17.2	197 58.2	•• 12.2	99 45.9	•• 47.0	195 03.9	102	·19 05.2	− 93
	22	330 14.4	110 37.1	50.4	46 24.7	17.0	213 00.2	12.1	114 48.1	47.1	209 33.1	102	18 55.9	− 94
	23	345 16.8	125 37.5	51.3	61 25.7	16.8	228 02.3	12.1	129 50.3	47.2	224 02.3	103	18 46.5	− 95
	24	0 19.3	140 38.0	−19 52.1	76 26.7	−26 16.6	243 04.3	+21 12.0	144 52.6	−11 47.3	238 31.6	104	+18 37.0	− 95
	code	—	+ 4	− 9	+ 10	+ 2	+ 21	0	+ 23	− 1				

G M T	SUN GHA	SUN Dec.
h	° ′	° ′
19 0	181 28.7	+ 1 46.9
1	196 28.9	45.9
2	211 29.1	44.9
3	226 29.3	·· 43.9
4	241 29.5	43.0
5	256 29.8	42.0
6	271 30.0	+ 1 41.0
7	286 30.2	40.1
8	301 30.4	39.1
9	316 30.7	·· 38.1
10	331 30.9	37.2
11	346 31.1	36.2
12	1 31.3	+ 1 35.2
13	16 31.5	34.2
14	31 31.8	33.3
15	46 32.0	·· 32.3
16	61 32.2	31.3
17	76 32.4	30.4
18	91 32.7	+ 1 29.4
19	106 32.9	28.4
20	121 33.1	27.5
21	136 33.3	·· 26.5
22	151 33.5	25.5
23	166 33.8	24.5
20 0	181 34.0	+ 1 23.6
1	196 34.2	22.6
2	211 34.4	21.6
3	226 34.6	·· 20.7
4	241 34.9	19.7
5	256 35.1	18.7
6	271 35.3	+ 1 17.8
7	286 35.5	16.8
8	301 35.8	15.8
9	316 36.0	·· 14.8
10	331 36.2	13.9
11	346 36.4	12.9
12	1 36.6	+ 1 11.9
13	16 36.9	11.0
14	31 37.1	10.0
15	46 37.3	·· 09.0
16	61 37.5	08.0
17	76 37.7	07.1
18	91 38.0	+ 1 06.1
19	106 38.2	05.1
20	121 38.4	04.2
21	136 38.6	·· 03.2
22	151 38.8	02.2
23	166 39.1	01.2
21 0	181 39.3	+ 1 00.3
1	196 39.5	0 59.3
2	211 39.7	58.3
3	226 39.9	·· 57.4
4	241 40.2	56.4
5	256 40.4	55.4
6	271 40.6	+ 0 54.4
7	286 40.8	53.5
8	301 41.1	52.5
9	316 41.3	·· 51.5
10	331 41.5	50.5
11	346 41.7	49.6
12	1 41.9	+ 0 48.6
13	16 42.2	47.6
14	31 42.4	46.7
15	46 42.6	·· 45.7
16	61 42.8	44.7
17	76 43.0	43.7
18	91 43.3	+ 0 42.8
19	106 43.5	41.8
20	121 43.7	40.8
21	136 43.9	·· 39.8
22	151 44.1	38.9
23	166 44.4	37.9
24	181 44.6	+ 0 36.9
code	–	– 9

STARS

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.4	−40 28.8
5	Achernar	335 58.8	−57 27.7
30	Acrux	173 59.5	−62 51.0
19	Adhara	255 47.2	−28 54.3
10	Aldebaran	291 39.8	+16 25.3
32	Alioth	166 59.6	+56 12.4
34	Alkaid	153 33.8	+49 32.4
55	Al Na'ir	28 38.4	−47 10.8
15	Alnilam	276 31.0	− 1 13.6
25	Alphard	218 39.6	− 8 27.6
41	Alphecca	126 48.4	+26 52.1
1	Alpheratz	358 28.8	+28 50.6
51	Altair	62 51.0	+ 8 45.0
2	Ankaa	353 58.5	−42 32.9
42	Antares	113 20.4	−26 20.1
37	Arcturus	146 36.1	+19 25.1
43	Atria	109 02.0	−68 57.2
22	Avior	234 36.5	−59 21.5
13	Bellatrix	279 19.2	+ 6 18.8
16	Betelg'se	271 49.0	+ 7 24.2
17	Canopus	264 15.8	−52 39.9
12	Capella	281 39.5	+45 57.2
53	Deneb	50 01.2	+45 07.4
28	Denebola	183 18.8	+14 49.5
4	Diphda	349 39.7	−18 13.8
27	Dubhe	194 46.0	+61 59.7
14	Elnath	279 08.2	+28 34.3
47	Eltanin	91 06.6	+51 29.9
54	Enif	34 30.1	+ 9 40.2
56	Fomalhaut	16 12.1	−29 51.6
31	Gacrux	172 50.7	−56 51.7
29	Gienah	176 38.0	−17 17.4
35	Hadar	149 51.1	−60 09.5
6	Hamal	328 50.2	+23 15.1
48	Kaus Aust.	84 42.1	−34 24.6
40	Kochab	137 18.5	+74 20.6
57	Markab	14 21.9	+14 57.9
8	Menkar	315 00.9	+ 3 55.0
36	Menkent	148 59.9	−36 09.0
24	Miapl'dus	221 50.0	−69 31.7
9	Mirfak	309 43.2	+49 42.1
50	Nunki	76 52.7	−26 21.3
52	Peacock	54 28.0	−56 53.0
21	Pollux	244 21.6	+28 08.2
20	Procyon	245 45.9	+ 5 20.6
46	R'alhague	96 47.3	+12 35.6
26	Regulus	208 30.6	+12 11.4
11	Rigel	281 54.3	− 8 14.9
38	Rigil Kent.	140 52.6	−60 39.3
44	Sabik	103 03.1	−15 40.2
3	Schedar	350 30.4	+56 17.5
45	Shaula	97 21.7	−37 04.5
18	Sirius	259 12.6	−16 38.9
33	Spica	159 18.0	−10 55.5
23	Suhail	223 25.3	−43 14.7
49	Vega	81 08.7	+38 44.7
39	Zub'g'bi	137 54.4	−15 51.3

Lat.	Sunrise	Twlt. begins	Moonrise 19	Moonrise 20	Moonrise 21	Moonrise 22
N °	h m	h m	h m	h m	h m	h m
72	5 27	////	□	□	□	23 23
70	5 30	0 49	□	□	21 19	23 55
68	5 32	1 43	□	□	22 13	24 18
66	5 34	2 14	□	20 42	22 46	24 36
64	5 36	2 36	19 41	21 24	23 09	24 51
62	5 37	2 53	20 21	21 52	23 28	25 03
60	5 38	3 07	20 49	22 13	23 43	25 13
58	5 39	3 19	21 11	22 31	23 56	25 22
56	5 40	3 28	21 29	22 46	24 08	0 08
54	5 41	3 37	21 44	22 58	24 17	0 17
52	5 42	3 44	21 57	23 10	24 26	0 26
50	5 42	3 50	22 08	23 19	24 34	0 34
45	5 44	4 04	22 32	23 40	24 50	0 50
40	5 45	4 13	22 51	23 57	25 04	1 04
35	5 46	4 20	23 06	24 11	0 11	1 15
30	5 47	4 26	23 20	24 23	0 23	1 25
20	5 48	4 35	23 44	24 44	0 44	1 42
10	5 49	4 39	24 04	0 04	1 02	1 57
0	5 50	4 42	24 23	0 23	1 19	2 11
10	5 51	4 42	24 41	0 41	1 35	2 25
20	5 52	4 40	0 04	1 02	1 53	2 39
30	5 53	4 34	0 29	1 25	2 14	2 56
35	5 53	4 31	0 43	1 38	2 26	3 06
40	5 53	4 24	0 59	1 54	2 39	3 17
45	5 54	4 18	1 19	2 13	2 56	3 30
50	5 54	4 08	1 44	2 36	3 16	3 46
52	5 54	4 03	1 56	2 47	3 25	3 53
54	5 55	3 57	2 10	3 00	3 36	4 01
56	5 55	3 51	2 26	3 15	3 48	4 10
58	5 55	3 43	2 45	3 32	4 01	4 21
60	5 55	3 35	3 08	3 52	4 17	4 32
S						

Lat.	Sunset	Twlt. ends	Moonset 19	Moonset 20	Moonset 21	Moonset 22
N °	h m	h m	h m	h m	h m	h m
72	18 17	////	□	□	□	18 33
70	18 15	22 42	□	□	18 52	17 59
68	18 13	21 55	□	□	17 56	17 34
66	18 11	21 26	□	17 36	17 23	17 15
64	18 10	21 05	16 38	16 54	16 58	17 00
62	18 09	20 49	15 57	16 25	16 39	16 46
60	18 08	20 36	15 29	16 03	16 23	16 35
58	18 07	20 25	15 07	15 45	16 09	16 26
56	18 06	20 15	14 49	15 30	15 58	16 17
54	18 05	20 07	14 34	15 17	15 47	16 09
52	18 04	20 00	14 21	15 05	15 38	16 03
50	18 04	19 54	14 10	14 55	15 30	15 56
45	18 02	19 41	13 46	14 34	15 12	15 43
40	18 01	19 32	13 26	14 16	14 58	15 32
35	18 01	19 26	13 10	14 02	14 45	15 22
30	18 00	19 20	12 56	13 49	14 34	15 14
20	17 59	19 12	12 32	13 27	14 16	14 59
10	17 58	19 08	12 11	13 08	13 59	14 47
0	17 57	19 06	11 52	12 50	13 44	14 35
10	17 56	19 06	11 33	12 32	13 29	14 22
20	17 56	19 09	11 12	12 12	13 12	14 09
30	17 55	19 15	10 48	11 50	12 53	13 54
35	17 55	19 19	10 33	11 37	12 42	13 46
40	17 55	19 26	10 17	11 22	12 29	13 36
45	17 54	19 33	9 57	11 03	12 13	13 24
50	17 54	19 43	9 32	10 41	11 54	13 09
52	17 54	19 49	9 20	10 30	11 45	13 02
54	17 54	19 55	9 06	10 18	11 35	12 55
56	17 54	20 01	8 51	10 03	11 24	12 46
58	17 53	20 08	8 32	9 46	11 11	12 37
60	17 53	20 18	8 09	9 26	10 55	12 26
S						

G M T	Equation of Time (App.—Mean) 19	20	21
h	m s	m s	m s
0	+ 5 54.2	+ 6 15.5	+ 6 36.7
6	+ 5 59.5	+ 6 20.8	+ 6 42.0
12	+ 6 04.8	+ 6 26.1	+ 6 47.3
18	+ 6 10.2	+ 6 31.4	+ 6 52.6
24	+ 6 15.5	+ 6 36.7	+ 6 57.9

GMT of Transit — Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
19	5 38	14 39	18 58	7 57	14 29
20	6 36	14 39	18 56	7 53	14 26
21	7 31	14 38	18 55	7 50	14 22
22	8 23	14 37	18 53	7 47	14 18

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.3	0.2	0.2
30			
	0.3	0.2	0.2
45			
	0.3	0.2	0.1
60			
	0.3	0.1	0.1
75			
	0.3	0.0	0.0
90			

Moon's Lower Limb — Add

Alt.	19	20	21
°	′	′	′
0	17.6	16.7	15.9
4	17.6	16.7	15.9
8	17.6	16.7	15.9
12	17.5	16.7	15.9
16	17.5	16.7	15.9
20	17.5	16.6	15.9
24	17.4	16.6	15.9
28	17.4	16.6	15.9
32	17.3	16.5	15.9
36	17.2	16.5	15.9
40	17.2	16.5	15.9
44	17.1	16.4	15.8
48	17.0	16.4	15.8
52	16.9	16.3	15.8
56	16.8	16.3	15.8
60	16.7	16.2	15.8
64	16.6	16.2	15.8
68	16.5	16.1	15.7
72	16.4	16.0	15.7
76	16.3	16.0	15.7
80	16.2	15.9	15.7
84	16.1	15.9	15.7
88	16.0	15.8	15.6
90			

Add to table, back cover

Moon's Upper Limb — Subtract

Alt.	19	20	21
°	′	′	′
0	14.4	14.9	15.3
4	14.4	14.9	15.3
8	14.4	14.9	15.3
12	14.4	14.9	15.3
16	14.5	14.9	15.3
20	14.5	15.0	15.4
24	14.5	15.0	15.4
28	14.6	15.0	15.4
32	14.7	15.0	15.4
36	14.7	15.1	15.4
40	14.8	15.1	15.4
44	14.9	15.2	15.4
48	15.0	15.2	15.4
52	15.0	15.3	15.5
56	15.1	15.3	15.5
60	15.2	15.4	15.5
64	15.3	15.4	15.5
68	15.4	15.5	15.5
72	15.5	15.5	15.5
76	15.7	15.6	15.6
80	15.8	15.7	15.6
84	15.9	15.7	15.6
88	16.0	15.8	15.6
90			

Subtract from table, back cover

Last Quarter 19

GMT	♈ GHA	VENUS −4.2 GHA	Dec.	MARS −0.6 GHA	Dec.	JUPITER −1.6 GHA	Dec.	SATURN 0.9 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
22 0	0 19.3	140 38.0	−19 52.1	76 26.7	−26 16.6	243 04.3	+21 12.0	144 52.6	−11 47.3	238 31.6	104	+18 37.0	−95
1	15 21.8	155 38.5	53.0	91 27.7	16.4	258 06.4	11.9	159 54.8	47.4	253 01.0	105	18 27.5	−97
2	30 24.2	170 38.9	53.9	106 28.7	16.2	273 08.5	11.9	174 57.0	47.5	267 30.5	105	18 17.8	−97
3	45 26.7	185 39.4	·· 54.7	121 29.7	·· 16.0	288 10.5	·· 11.8	189 59.2	·· 47.6	282 00.0	107	·18 08.1	−99
4	60 29.1	200 39.9	55.6	136 30.7	15.8	303 12.6	11.7	205 01.4	47.7	296 29.7	107	17 58.2	−99
5	75 31.6	215 40.4	56.5	151 31.7	15.6	318 14.7	11.7	220 03.7	47.7	310 59.4	109	17 48.3	−100
6	90 34.1	230 40.8	−19 57.3	166 32.6	−26 15.4	333 16.7	+21 11.6	235 05.9	−11 47.8	325 29.3	109	+17 38.3	−101
7	105 36.5	245 41.3	58.2	181 33.6	15.2	348 18.8	11.5	250 08.1	47.9	339 59.2	110	17 28.2	−101
8	120 39.0	260 41.8	59.1	196 34.6	14.9	3 20.8	11.5	265 10.3	48.0	354 29.2	111	17 18.1	−103
9	135 41.5	275 42.3	·19 59.9	211 35.6	·· 14.7	18 22.9	·· 11.4	280 12.5	·· 48.1	8 59.3	111	·17 07.8	−103
10	150 43.9	290 42.8	20 00.8	226 36.6	14.5	33 25.0	11.4	295 14.8	48.2	23 29.4	113	16 57.5	−104
11	165 46.4	305 43.3	01.6	241 37.6	14.3	48 27.0	11.3	310 17.0	48.3	37 59.7	113	16 47.1	−104
12	180 48.9	320 43.7	−20 02.5	256 38.6	−26 14.1	63 29.1	+21 11.2	325 19.2	−11 48.4	52 30.0	114	+16 36.7	−106
13	195 51.3	335 44.2	03.4	271 39.6	13.9	78 31.1	11.2	340 21.4	48.5	67 00.4	115	16 26.1	−106
14	210 53.8	350 44.7	04.2	286 40.6	13.7	93 33.2	11.1	355 23.6	48.5	81 30.9	116	16 15.5	−107
15	225 56.3	5 45.2	·· 05.1	301 41.6	·· 13.5	108 35.3	·· 11.0	10 25.8	·· 48.6	96 01.5	117	·16 04.8	−107
16	240 58.7	20 45.7	05.9	316 42.6	13.3	123 37.3	11.0	25 28.1	48.7	110 32.2	117	15 54.1	−109
17	256 01.2	35 46.2	06.8	331 43.6	13.0	138 39.4	10.9	40 30.3	48.8	125 02.9	118	15 43.2	−109
18	271 03.6	50 46.6	−20 07.6	346 44.6	−26 12.8	153 41.5	+21 10.8	55 32.5	−11 48.9	139 33.7	120	+15 32.3	−109
19	286 06.1	65 47.1	08.5	1 45.6	12.6	168 43.5	10.8	70 34.7	49.0	154 04.7	119	15 21.4	−110
20	301 08.6	80 47.6	09.3	16 46.5	12.4	183 45.6	10.7	85 36.9	49.1	168 35.6	121	15 10.4	−111
21	316 11.0	95 48.1	·· 10.2	31 47.5	·· 12.2	198 47.7	·· 10.6	100 39.1	·· 49.2	183 06.7	121	·14 59.3	−112
22	331 13.5	110 48.6	11.0	46 48.5	12.0	213 49.7	10.6	115 41.4	49.3	197 37.8	122	14 48.1	−112
23	346 16.0	125 49.1	11.9	61 49.5	11.8	228 51.8	10.5	130 43.6	49.3	212 09.0	123	14 36.9	−113
23 0	1 18.4	140 49.6	−20 12.7	76 50.5	−26 11.5	243 53.9	+21 10.5	145 45.8	−11 49.4	226 40.3	124	+14 25.6	−113
1	16 20.9	155 50.1	13.6	91 51.5	11.3	258 55.9	10.4	160 48.0	49.5	241 11.7	124	14 14.3	−114
2	31 23.4	170 50.6	14.4	106 52.5	11.1	273 58.0	10.3	175 50.2	49.6	255 43.1	125	14 02.9	−115
3	46 25.8	185 51.1	·· 15.3	121 53.5	·· 10.9	289 00.1	·· 10.3	190 52.4	·· 49.7	270 14.6	126	·13 51.4	−115
4	61 28.3	200 51.6	16.1	136 54.4	10.7	304 02.1	10.2	205 54.7	49.8	284 46.2	127	13 39.9	−115
5	76 30.8	215 52.1	17.0	151 55.4	10.5	319 04.2	10.1	220 56.9	49.9	299 17.9	127	13 28.4	−116
6	91 33.2	230 52.6	−20 17.8	166 56.4	−26 10.3	334 06.3	+21 10.1	235 59.1	−11 50.0	313 49.6	128	+13 16.8	−117
7	106 35.7	245 53.1	18.7	181 57.4	10.0	349 08.3	10.0	251 01.3	50.1	328 21.4	129	13 05.1	−117
8	121 38.1	260 53.6	19.5	196 58.4	09.8	4 10.4	09.9	266 03.5	50.2	342 53.3	129	12 53.4	−118
9	136 40.6	275 54.1	·· 20.4	211 59.4	·· 09.6	19 12.5	·· 09.9	281 05.7	·· 50.2	357 25.2	130	·12 41.6	−118
10	151 43.1	290 54.6	21.2	227 00.3	09.4	34 14.5	09.8	296 08.0	50.3	11 57.2	131	12 29.8	−119
11	166 45.5	305 55.1	22.1	242 01.3	09.2	49 16.6	09.7	311 10.2	50.4	26 29.3	131	12 17.9	−119
12	181 48.0	320 55.6	−20 22.9	257 02.3	−26 09.0	64 18.7	+21 09.7	326 12.4	−11 50.5	41 01.4	132	+12 06.0	−120
13	196 50.5	335 56.1	23.7	272 03.3	08.7	79 20.7	09.6	341 14.6	50.6	55 33.6	133	11 54.0	−120
14	211 52.9	350 56.6	24.6	287 04.3	08.5	94 22.8	09.6	356 16.8	50.7	70 05.9	134	11 42.0	−120
15	226 55.4	5 57.1	·· 25.4	302 05.2	·· 08.3	109 24.9	·· 09.5	11 19.0	·· 50.8	84 38.3	134	·11 30.0	−121
16	241 57.9	20 57.6	26.2	317 06.2	08.1	124 26.9	09.4	26 21.3	50.9	99 10.7	134	11 17.9	−121
17	257 00.3	35 58.2	27.1	332 07.2	07.9	139 29.0	09.4	41 23.5	51.0	113 43.1	135	11 05.8	−122
18	272 02.8	50 58.7	−20 27.9	347 08.2	−26 07.6	154 31.1	+21 09.3	56 25.7	−11 51.0	128 15.6	136	+10 53.6	−122
19	287 05.2	65 59.2	28.8	2 09.2	07.4	169 33.1	09.2	71 27.9	51.1	142 48.2	137	10 41.4	−123
20	302 07.7	80 59.7	29.6	17 10.1	07.2	184 35.2	09.2	86 30.1	51.2	157 20.9	137	10 29.1	−123
21	317 10.2	96 00.2	·· 30.4	32 11.1	·· 07.0	199 37.3	·· 09.1	101 32.3	·· 51.3	171 53.6	137	·10 16.8	−123
22	332 12.6	111 00.7	31.3	47 12.1	06.8	214 39.3	09.1	116 34.5	51.4	186 26.3	139	10 04.5	−124
23	347 15.1	126 01.2	32.1	62 13.1	06.5	229 41.4	09.0	131 36.8	51.5	200 59.2	138	9 52.1	−124
24 0	2 17.6	141 01.8	−20 32.9	77 14.0	−26 06.3	244 43.5	+21 08.9	146 39.0	−11 51.6	215 32.0	140	+ 9 39.7	−124
1	17 20.0	156 02.3	33.8	92 15.0	06.1	259 45.6	08.9	161 41.2	51.7	230 05.0	139	9 27.3	−125
2	32 22.5	171 02.8	34.6	107 16.0	05.9	274 47.6	08.8	176 43.4	51.8	244 37.9	141	9 14.8	−125
3	47 25.0	186 03.3	·· 35.4	122 17.0	·· 05.7	289 49.7	·· 08.7	191 45.6	·· 51.9	259 11.0	141	· 9 02.3	−125
4	62 27.4	201 03.8	36.2	137 17.9	05.4	304 51.8	08.7	206 47.8	51.9	273 44.1	141	8 49.8	−125
5	77 29.9	216 04.4	37.1	152 18.9	05.2	319 53.8	08.6	221 50.1	52.0	288 17.2	142	8 37.3	−126
6	92 32.4	231 04.9	−20 37.9	167 19.9	−26 05.0	334 55.9	+21 08.5	236 52.3	−11 52.1	302 50.4	143	+ 8 24.7	−126
7	107 34.8	246 05.4	38.7	182 20.8	04.8	349 58.0	08.5	251 54.5	52.2	317 23.7	143	8 12.1	−127
8	122 37.3	261 05.9	39.6	197 21.8	04.5	5 00.1	08.4	266 56.7	52.3	331 57.0	143	7 59.4	−126
9	137 39.7	276 06.5	·· 40.4	212 22.8	·· 04.3	20 02.1	·· 08.4	281 58.9	·· 52.4	346 30.3	144	· 7 46.8	−127
10	152 42.2	291 07.0	41.2	227 23.8	04.1	35 04.2	08.3	297 01.1	52.5	1 03.7	145	7 34.1	−127
11	167 44.7	306 07.5	42.0	242 24.7	03.9	50 06.3	08.2	312 03.3	52.6	15 37.2	144	7 21.4	−128
12	182 47.1	321 08.1	−20 42.9	257 25.7	−26 03.6	65 08.4	+21 08.2	327 05.5	−11 52.7	30 10.6	146	+ 7 08.6	−127
13	197 49.6	336 08.6	43.7	272 26.7	03.4	80 10.4	08.1	342 07.8	52.8	44 44.2	146	6 55.9	−128
14	212 52.1	351 09.1	44.5	287 27.6	03.2	95 12.5	08.0	357 10.0	52.8	59 17.8	146	6 43.1	−128
15	227 54.5	6 09.7	·· 45.3	302 28.6	·· 03.0	110 14.6	·· 08.0	12 12.2	·· 52.9	73 51.4	146	· 6 30.3	−128
16	242 57.0	21 10.2	46.1	317 29.6	02.7	125 16.6	07.9	27 14.4	53.0	88 25.0	147	6 17.5	−128
17	257 59.5	36 10.7	47.0	332 30.5	02.5	140 18.7	07.8	42 16.6	53.1	102 58.7	148	6 04.7	−129
18	273 01.9	51 11.3	−20 47.8	347 31.5	−26 02.3	155 20.8	+21 07.8	57 18.8	−11 53.2	117 32.5	148	+ 5 51.8	−129
19	288 04.4	66 11.8	48.6	2 32.5	02.1	170 22.9	07.7	72 21.0	53.3	132 06.3	148	5 38.9	−128
20	303 06.8	81 12.3	49.4	17 33.4	01.8	185 24.9	07.7	87 23.3	53.4	146 40.1	148	5 26.1	−129
21	318 09.3	96 12.9	·· 50.2	32 34.4	·· 01.6	200 27.0	·· 07.6	102 25.5	·· 53.5	161 13.9	149	· 5 13.2	−130
22	333 11.8	111 13.4	51.0	47 35.4	01.4	215 29.1	07.5	117 27.7	53.6	175 47.8	150	5 00.2	−129
23	348 14.2	126 14.0	51.9	62 36.3	01.2	230 31.2	07.5	132 29.9	53.7	190 21.8	149	4 47.3	−129
24	3 16.7	141 14.5	−20 52.7	77 37.3	−26 00.9	245 33.3	+21 07.4	147 32.1	−11 53.7	204 55.7	150	+ 4 34.4	−129
code	—	+ 5	− 8	+ 10	+ 3	+ 20	− 1	+ 22	− 1				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
22 0	181 44.6	+ 0 36.9
1	196 44.8	36.0
2	211 45.0	35.0
3	226 45.2 ··	34.0
4	241 45.5	33.0
5	256 45.7	32.1
6	271 45.9	+ 0 31.1
7	286 46.1	30.1
8	301 46.3	29.1
9	316 46.6 ··	28.2
10	331 46.8	27.2
11	346 47.0	26.2
12	1 47.2	+ 0 25.2
13	16 47.4	24.3
14	31 47.6	23.3
15	46 47.9 ··	22.3
16	61 48.1	21.4
17	76 48.3	20.4
18	91 48.5	+ 0 19.4
19	106 48.7	18.4
20	121 49.0	17.5
21	136 49.2 ··	16.5
22	151 49.4	15.5
23	166 49.6	14.5
23 0	181 49.8	+ 0 13.6
1	196 50.1	12.6
2	211 50.3	11.6
3	226 50.5 ··	10.6
4	241 50.7	09.7
5	256 50.9	08.7
6	271 51.1	+ 0 07.7
7	286 51.4	06.7
8	301 51.6	05.8
9	316 51.8 ··	04.8
10	331 52.0	03.8
11	346 52.2	02.8
12	1 52.5	+ 0 01.9
13	16 52.7	+ 00.9
14	31 52.9	− 00.1
15	46 53.1 ··	01.0
16	61 53.3	02.0
17	76 53.5	03.0
18	91 53.8	− 0 04.0
19	106 54.0	04.9
20	121 54.2	05.9
21	136 54.4 ··	06.9
22	151 54.6	07.9
23	166 54.8	08.8
24 0	181 55.1	− 0 09.8
1	196 55.3	10.8
2	211 55.5	11.8
3	226 55.7 ··	12.7
4	241 55.9	13.7
5	256 56.1	14.7
6	271 56.4	− 0 15.7
7	286 56.6	16.6
8	301 56.8	17.6
9	316 57.0 ··	18.6
10	331 57.2	19.6
11	346 57.4	20.5
12	1 57.7	− 0 21.5
13	16 57.9	22.5
14	31 58.1	23.5
15	46 58.3 ··	24.4
16	61 58.5	25.4
17	76 58.7	26.4
18	91 59.0	− 0 27.4
19	106 59.2	28.3
20	121 59.4	29.3
21	136 59.6 ··	30.3
22	151 59.8	31.3
23	167 00.0	32.2
24	182 00.3	− 0 33.2
code	—	− 10

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.3	−40 28.8
5	Achernar	335 58.8	−57 27.7
30	Acrux	173 59.5	−62 51.0
19	Adhara	255 47.2	−28 54.3
10	Aldebaran	291 39.8	+16 25.3
32	Alioth	166 59.6	+56 12.3
34	Alkaid	153 33.8	+49 32.4
55	Al Na'ir	28 38.4	−47 10.8
15	Alnilam	276 31.0	− 1 13.6
25	Alphard	218 39.6	− 8 27.6
41	Alphecca	126 48.5	+26 52.1
1	Alpheratz	358 28.8	+28 50.7
51	Altair	62 51.0	+ 8 45.0
2	Ankaa	353 58.5	−42 32.9
42	Antares	113 20.4	−26 20.1
37	Arcturus	146 36.1	+19 25.1
43	Atria	109 02.0	−68 57.2
22	Avior	234 36.5	−59 21.5
13	Bellatrix	279 19.2	+ 6 18.8
16	Betelg'se	271 48.9	+ 7 24.2
17	Canopus	264 15.8	−52 39.9
12	Capella	281 39.4	+45 57.2
53	Deneb	50 01.3	+45 07.4
28	Denebola	183 18.8	+14 49.5
4	Diphda	349 39.7	−18 13.8
27	Dubhe	194 46.0	+61 59.6
14	Elnath	279 08.2	+28 34.3
47	Eltanin	91 06.6	+51 29.9
54	Enif	34 30.1	+ 9 40.2
56	Fomalhaut	16 12.1	−29 51.6
31	Gacrux	172 50.7	−56 51.7
29	Gienah	176 38.0	−17 17.4
35	Hadar	149 51.1	−60 09.5
6	Hamal	328 50.2	+23 15.1
48	Kaus Aust.	84 42.1	−34 24.6
40	Kochab	137 18.6	+74 20.6
57	Markab	14 21.9	+14 57.9
8	Menkar	315 00.9	+ 3 55.0
36	Menkent	148 59.9	−36 09.0
24	Miapl'dus	221 50.0	−69 31.6
9	Mirfak	309 43.2	+49 42.1
50	Nunki	76 52.7	−26 21.3
52	Peacock	54 28.1	−56 53.0
21	Pollux	244 21.6	+28 08.2
20	Procyon	245 45.9	+ 5 20.6
46	R'alhague	96 47.3	+12 35.6
26	Regulus	208 30.6	+12 11.4
11	Rigel	281 54.3	− 8 14.9
38	Rigil Kent.	140 52.6	−60 39.2
44	Sabik	103 03.1	−15 40.2
3	Schedar	350 30.4	+56 17.5
45	Shaula	97 21.8	−37 04.5
18	Sirius	259 12.6	−16 38.9
33	Spica	159 18.0	−10 55.5
23	Suhail	223 25.2	−43 14.7
49	Vega	81 08.7	+38 44.7
39	Zub'g'bi	137 54.4	−15 51.3

Lat.	Sunrise	Twlt. begins	Moonrise 22	Moonrise 23	Moonrise 24	Moonrise 25
°	h m	h m	h m	h m	h m	h m
N 72	5 41	////	23 23	25 41	1 41	3 41
70	5 42	1 26	23 55	25 56	1 56	3 47
68	5 43	2 04	24 18	0 18	2 08	3 51
66	5 44	2 30	24 36	0 36	2 18	3 54
64	5 44	2 49	24 51	0 51	2 26	3 58
62	5 45	3 04	25 03	1 03	2 33	4 00
60	5 45	3 17	25 13	1 13	2 39	4 02
58	5 46	3 26	25 22	1 22	2 44	4 05
56	5 46	3 36	0 08	1 29	2 49	4 06
54	5 46	3 44	0 17	1 36	2 53	4 08
52	5 47	3 50	0 26	1 42	2 57	4 09
50	5 47	3 55	0 34	1 48	3 00	4 11
45	5 47	4 07	0 50	2 00	3 08	4 14
40	5 48	4 16	1 04	2 10	3 14	4 16
35	5 48	4 22	1 15	2 18	3 19	4 18
30	5 48	4 28	1 25	2 26	3 24	4 20
20	5 49	4 36	1 42	2 38	3 32	4 23
10	5 49	4 39	1 57	2 49	3 39	4 26
0	5 49	4 41	2 11	3 00	3 45	4 28
10	5 49	4 40	2 25	3 10	3 52	4 31
20	5 49	4 37	2 39	3 21	3 58	4 34
30	5 49	4 30	2 56	3 33	4 06	4 37
35	5 49	4 25	3 06	3 40	4 11	4 39
40	5 49	4 19	3 17	3 48	4 16	4 41
45	5 48	4 11	3 30	3 58	4 22	4 43
50	5 48	4 00	3 46	4 09	4 29	4 46
52	5 48	3 55	3 53	4 14	4 32	4 47
54	5 48	3 49	4 01	4 20	4 36	4 49
56	5 47	3 42	4 10	4 27	4 39	4 50
58	5 47	3 34	4 21	4 34	4 44	4 52
60	5 47	3 24	4 32	4 42	4 49	4 54
S						

Lat.	Sunset	Twlt. ends	Moonset 22	Moonset 23	Moonset 24	Moonset 25
°	h m	h m	h m	h m	h m	h m
N 72	18 02	23 24	18 33	17 51	17 23	16 59
70	18 01	22 07	17 59	17 33	17 15	16 58
68	18 00	21 32	17 34	17 20	17 08	16 57
66	18 00	21 08	17 15	17 08	17 02	16 56
64	17 59	20 50	17 00	16 59	16 58	16 56
62	17 59	20 36	16 46	16 51	16 53	16 55
60	17 58	20 23	16 35	16 43	16 50	16 55
58	17 58	20 14	16 26	16 37	16 46	16 54
56	17 58	20 06	16 17	16 31	16 44	16 54
54	17 58	19 59	16 09	16 26	16 41	16 54
52	17 57	19 52	16 03	16 22	16 38	16 53
50	17 57	19 47	15 56	16 18	16 36	16 53
45	17 57	19 36	15 43	16 09	16 32	16 52
40	17 56	19 27	15 32	16 01	16 27	16 52
35	17 56	19 21	15 22	15 55	16 24	16 51
30	17 56	19 16	15 14	15 49	16 21	16 51
20	17 56	19 09	14 59	15 39	16 15	16 50
10	17 56	19 06	14 47	15 30	16 11	16 49
0	17 56	19 05	14 35	15 22	16 06	16 49
10	17 56	19 06	14 22	15 13	16 01	16 48
20	17 56	19 09	14 09	15 04	15 57	16 47
30	17 56	19 16	13 54	14 54	15 51	16 46
35	17 57	19 22	13 46	14 48	15 48	16 46
40	17 57	19 28	13 36	14 41	15 44	16 45
45	17 57	19 36	13 24	14 33	15 40	16 45
50	17 58	19 48	13 09	14 23	15 34	16 44
52	17 58	19 53	13 02	14 18	15 32	16 43
54	17 58	20 00	12 55	14 13	15 29	16 43
56	17 59	20 08	12 46	14 07	15 26	16 43
58	17 59	20 16	12 37	14 01	15 23	16 42
60	18 00	20 26	12 26	13 54	15 19	16 41
S						

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.3	0.3	0.2
30			
	0.3	0.2	0.2
45			
	0.3	0.2	0.1
60			
	0.3	0.1	0.1
75			
	0.3	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	22	23	24
°	′	′	′
0			
	15.2	14.5	13.9
4			
	15.2	14.5	13.9
8			
	15.2	14.5	13.9
12			
	15.2	14.6	13.9
16			
	15.2	14.6	14.0
20			
	15.2	14.6	14.0
24			
	15.2	14.6	14.0
28			
	15.2	14.6	14.1
32			
	15.2	14.7	14.1
36			
	15.2	14.7	14.2
40			
	15.2	14.7	14.2
44			
	15.3	14.8	14.3
48			
	15.3	14.8	14.4
52			
	15.3	14.9	14.4
56			
	15.3	14.9	14.5
60			
	15.3	15.0	14.6
64			
	15.3	15.0	14.7
68			
	15.4	15.1	14.8
72			
	15.4	15.1	14.8
76			
	15.4	15.2	14.9
80			
	15.4	15.2	15.0
84			
	15.4	15.3	15.1
88			
	15.5	15.3	15.2
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	22	23	24
°	′	′	′
0			
	15.8	16.1	16.5
4			
	15.8	16.1	16.5
8			
	15.8	16.1	16.5
12			
	15.8	16.1	16.5
16			
	15.8	16.1	16.4
20			
	15.7	16.1	16.4
24			
	15.7	16.1	16.4
28			
	15.7	16.0	16.3
32			
	15.7	16.0	16.3
36			
	15.7	16.0	16.2
40			
	15.7	15.9	16.2
44			
	15.7	15.9	16.1
48			
	15.7	15.8	16.0
52			
	15.6	15.8	16.0
56			
	15.6	15.8	15.9
60			
	15.6	15.7	15.8
64			
	15.6	15.7	15.7
68			
	15.6	15.6	15.6
72			
	15.6	15.6	15.6
76			
	15.5	15.5	15.5
80			
	15.5	15.4	15.4
84			
	15.5	15.4	15.3
88			
	15.5	15.3	15.2
90			

Subtract from table, back cover

Equation of Time (App.—Mean)

GMT	22	23	24
h	m s	m s	m s
0	+ 6 57.9	+ 7 18.9	+ 7 39.8
6	+ 7 03.1	+ 7 24.1	+ 7 45.0
12	+ 7 08.4	+ 7 29.4	+ 7 50.2
18	+ 7 13.7	+ 7 34.6	+ 7 55.4
24	+ 7 18.9	+ 7 39.8	+ 8 00.6

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
22	8 23	14 37	18 53	7 47	14 18
23	9 11	14 36	18 51	7 43	14 15
24	9 56	14 35	18 50	7 40	14 11
25	10 39	14 35	18 48	7 37	14 08

GMT	♈ GHA	VENUS −4.2 GHA	VENUS Dec.	MARS −0.5 GHA	MARS Dec.	JUPITER −1.6 GHA	JUPITER Dec.	SATURN 0.9 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
25 0	3 16.7	141 14.5	−20 52.7	77 37.3	−26 00.9	245 33.3	+21 07.4	147 32.1	−11 53.7	204 55.7	150	+ 4 34.4	−129
1	18 19.2	156 15.1	53.5	92 38.2	00.7	260 35.3	07.3	162 34.3	53.8	219 29.7	151	4 21.5	−130
2	33 21.6	171 15.6	54.3	107 39.2	00.5	275 37.4	07.3	177 36.5	53.9	234 03.8	151	4 08.5	−130
3	48 24.1	186 16.2	·· 55.1	122 40.2	·· 00.2	290 39.5	·· 07.2	192 38.8	·· 54.0	248 37.9	151	· 3 55.5	−129
4	63 26.6	201 16.7	55.9	137 41.1	26 00.0	305 41.6	07.2	207 41.0	54.1	263 12.0	151	3 42.6	−130
5	78 29.0	216 17.3	56.7	152 42.1	25 59.8	320 43.6	07.1	222 43.2	54.2	277 46.1	151	3 29.6	−130
6	93 31.5	231 17.8	−20 57.5	167 43.1	−25 59.6	335 45.7	+21 07.0	237 45.4	−11 54.3	292 20.2	152	+ 3 16.6	−130
7	108 34.0	246 18.4	58.3	182 44.0	59.3	350 47.8	07.0	252 47.6	54.4	306 54.4	153	3 03.6	−130
8	123 36.4	261 18.9	20 59.1	197 45.0	59.1	5 49.9	06.9	267 49.8	54.5	321 28.7	152	2 50.6	−130
9	138 38.9	276 19.5	·21 00.0	212 45.9	·· 58.9	20 51.9	·· 06.8	282 52.0	·· 54.6	336 02.9	153	· 2 37.6	−130
10	153 41.3	291 20.0	00.8	227 46.9	58.6	35 54.0	06.8	297 54.2	54.6	350 37.2	153	2 24.6	−130
11	168 43.8	306 20.6	01.6	242 47.8	58.4	50 56.1	06.7	312 56.5	54.7	5 11.5	153	2 11.6	−130
12	183 46.3	321 21.1	−21 02.4	257 48.8	−25 58.2	65 58.2	+21 06.7	327 58.7	−11 54.8	19 45.8	153	+ 1 58.6	−130
13	198 48.7	336 21.7	03.2	272 49.8	57.9	81 00.3	06.6	343 00.9	54.9	34 20.1	154	1 45.6	−130
14	213 51.2	351 22.2	04.0	287 50.7	57.7	96 02.3	06.5	358 03.1	55.0	48 54.5	154	1 32.6	−130
15	228 53.7	6 22.8	·· 04.8	302 51.7	·· 57.5	111 04.4	·· 06.5	13 05.3	·· 55.1	63 28.9	154	· 1 19.6	−129
16	243 56.1	21 23.4	05.6	317 52.6	57.2	126 06.5	06.4	28 07.5	55.2	78 03.3	154	1 06.7	−130
17	258 58.6	36 23.9	06.4	332 53.6	57.0	141 08.6	06.3	43 09.7	55.3	92 37.7	155	0 53.7	−130
18	274 01.1	51 24.5	−21 07.2	347 54.5	−25 56.8	156 10.7	+21 06.3	58 11.9	−11 55.4	107 12.2	154	+ 0 40.7	−130
19	289 03.5	66 25.1	08.0	2 55.5	56.5	171 12.7	06.2	73 14.1	55.5	121 46.6	155	0 27.7	−130
20	304 06.0	81 25.6	08.8	17 56.4	56.3	186 14.8	06.2	88 16.4	55.5	136 21.1	155	0 14.7	−130
21	319 08.5	96 26.2	·· 09.6	32 57.4	·· 56.1	201 16.9	·· 06.1	103 18.6	·· 55.6	150 55.6	155	+ 0 01.7	−129
22	334 10.9	111 26.8	10.4	47 58.3	55.8	216 19.0	06.0	118 20.8	55.7	165 30.1	156	− 0 11.2	−130
23	349 13.4	126 27.3	11.2	62 59.3	55.6	231 21.1	06.0	133 23.0	55.8	180 04.7	155	0 24.2	−129
26 0	4 15.8	141 27.9	−21 12.0	78 00.3	−25 55.4	246 23.1	+21 05.9	148 25.2	−11 55.9	194 39.2	156	− 0 37.1	−129
1	19 18.3	156 28.5	12.7	93 01.2	55.1	261 25.2	05.8	163 27.4	56.0	209 13.8	156	0 50.0	−130
2	34 20.8	171 29.0	13.5	108 02.2	54.9	276 27.3	05.8	178 29.6	56.1	223 48.4	155	1 03.0	−129
3	49 23.2	186 29.6	·· 14.3	123 03.1	·· 54.7	291 29.4	·· 05.7	193 31.8	·· 56.2	238 22.9	156	· 1 15.9	−129
4	64 25.7	201 30.2	15.1	138 04.1	54.4	306 31.5	05.7	208 34.0	56.3	252 57.5	156	1 28.8	−129
5	79 28.2	216 30.8	15.9	153 05.0	54.2	321 33.6	05.6	223 36.3	56.4	267 32.1	156	1 41.7	−128
6	94 30.6	231 31.3	−21 16.7	168 06.0	−25 54.0	336 35.6	+21 05.5	238 38.5	−11 56.5	282 06.7	157	− 1 54.5	−129
7	109 33.1	246 31.9	17.5	183 06.9	53.7	351 37.7	05.5	253 40.7	56.5	296 41.4	156	2 07.4	−128
8	124 35.6	261 32.5	18.3	198 07.8	53.5	6 39.8	05.4	268 42.9	56.6	311 16.0	156	2 20.2	−129
9	139 38.0	276 33.1	·· 19.1	213 08.8	·· 53.2	21 41.9	·· 05.3	283 45.1	·· 56.7	325 50.6	157	· 2 33.1	−128
10	154 40.5	291 33.7	19.9	228 09.7	53.0	36 44.0	05.3	298 47.3	56.8	340 25.3	156	2 45.9	−127
11	169 42.9	306 34.3	20.6	243 10.7	52.8	51 46.1	05.2	313 49.5	56.9	354 59.9	157	2 58.6	−128
12	184 45.4	321 34.8	−21 21.4	258 11.6	−25 52.5	66 48.1	+21 05.2	328 51.7	−11 57.0	9 34.6	156	− 3 11.4	−128
13	199 47.9	336 35.4	22.2	273 12.6	52.3	81 50.2	05.1	343 53.9	57.1	24 09.2	157	3 24.2	−127
14	214 50.3	351 36.0	23.0	288 13.5	52.1	96 52.3	05.0	358 56.1	57.2	38 43.9	156	3 36.9	−127
15	229 52.8	6 36.6	·· 23.8	303 14.5	·· 51.8	111 54.4	·· 05.0	13 58.4	·· 57.3	53 18.5	157	· 3 49.6	−127
16	244 55.3	21 37.2	24.6	318 15.4	51.6	126 56.5	04.9	29 00.6	57.4	67 53.2	156	4 02.3	−127
17	259 57.7	36 37.8	25.3	333 16.4	51.3	141 58.6	04.9	44 02.8	57.5	82 27.8	157	4 15.0	−126
18	275 00.2	51 38.4	−21 26.1	348 17.3	−25 51.1	157 00.7	+21 04.8	59 05.0	−11 57.5	97 02.5	156	− 4 27.6	−126
19	290 02.7	66 39.0	26.9	3 18.2	50.9	172 02.7	04.7	74 07.2	57.6	111 37.1	157	4 40.2	−126
20	305 05.1	81 39.6	27.7	18 19.2	50.6	187 04.8	04.7	89 09.4	57.7	126 11.8	156	4 52.8	−126
21	320 07.6	96 40.2	·· 28.5	33 20.1	·· 50.4	202 06.9	·· 04.6	104 11.6	·· 57.8	140 46.4	157	· 5 05.4	−125
22	335 10.1	111 40.8	29.2	48 21.1	50.1	217 09.0	04.5	119 13.8	57.9	155 21.1	156	5 17.9	−125
23	350 12.5	126 41.3	30.0	63 22.0	49.9	232 11.1	04.5	134 16.0	58.0	169 55.7	156	5 30.4	−125
27 0	5 15.0	141 41.9	−21 30.8	78 22.9	−25 49.7	247 13.2	+21 04.4	149 18.2	−11 58.1	184 30.3	157	− 5 42.9	−124
1	20 17.4	156 42.5	31.6	93 23.9	49.4	262 15.3	04.4	164 20.5	58.2	199 05.0	156	5 55.3	−125
2	35 19.9	171 43.2	32.3	108 24.8	49.2	277 17.3	04.3	179 22.7	58.3	213 39.6	156	6 07.8	−124
3	50 22.4	186 43.8	·· 33.1	123 25.8	·· 48.9	292 19.4	·· 04.2	194 24.9	·· 58.4	228 14.2	156	· 6 20.2	−123
4	65 24.8	201 44.4	33.9	138 26.7	48.7	307 21.5	04.2	209 27.1	58.4	242 48.8	156	6 32.5	−124
5	80 27.3	216 45.0	34.6	153 27.6	48.4	322 23.6	04.1	224 29.3	58.5	257 23.4	156	6 44.9	−122
6	95 29.8	231 45.6	−21 35.4	168 28.6	−25 48.2	337 25.7	+21 04.1	239 31.5	−11 58.6	271 58.0	155	− 6 57.1	−123
7	110 32.2	246 46.2	36.2	183 29.5	48.0	352 27.8	04.0	254 33.7	58.7	286 32.5	156	7 09.4	−122
8	125 34.7	261 46.8	37.0	198 30.4	47.7	7 29.9	03.9	269 35.9	58.8	301 07.1	156	7 21.6	−122
9	140 37.2	276 47.4	·· 37.7	213 31.4	·· 47.5	22 32.0	·· 03.9	284 38.1	·· 58.9	315 41.7	155	· 7 33.8	−122
10	155 39.6	291 48.0	38.5	228 32.3	47.2	37 34.1	03.8	299 40.3	59.0	330 16.2	155	7 46.0	−121
11	170 42.1	306 48.6	39.3	243 33.3	47.0	52 36.1	03.7	314 42.5	59.1	344 50.7	155	7 58.1	−121
12	185 44.5	321 49.2	−21 40.0	258 34.2	−25 46.7	67 38.2	+21 03.7	329 44.7	−11 59.2	359 25.2	155	− 8 10.2	−120
13	200 47.0	336 49.9	40.8	273 35.1	46.5	82 40.3	03.6	344 47.0	59.3	13 59.7	155	8 22.2	−120
14	215 49.5	351 50.5	41.5	288 36.1	46.2	97 42.4	03.6	359 49.2	59.4	28 34.2	154	8 34.2	−120
15	230 51.9	6 51.1	·· 42.3	303 37.0	·· 46.0	112 44.5	·· 03.5	14 51.4	·· 59.4	43 08.6	155	· 8 46.2	−119
16	245 54.4	21 51.7	43.1	318 37.9	45.8	127 46.6	03.4	29 53.6	59.5	57 43.1	154	8 58.1	−119
17	260 56.9	36 52.3	43.8	333 38.9	45.5	142 48.7	03.4	44 55.8	59.6	72 17.5	154	9 10.0	−119
18	275 59.3	51 53.0	−21 44.6	348 39.8	−25 45.3	157 50.8	+21 03.3	59 58.0	−11 59.7	86 51.9	154	− 9 21.9	−118
19	291 01.8	66 53.6	45.3	3 40.7	45.0	172 52.9	03.3	75 00.2	59.8	101 26.3	154	9 33.7	−117
20	306 04.3	81 54.2	46.1	18 41.6	44.8	187 55.0	03.2	90 02.4	11 59.9	116 00.7	153	9 45.4	−117
21	321 06.7	96 54.8	·· 46.9	33 42.6	·· 44.5	202 57.1	·· 03.1	105 04.6	·12 00.0	130 35.0	153	· 9 57.1	−117
22	336 09.2	111 55.5	47.6	48 43.5	44.3	217 59.1	03.1	120 06.8	00.1	145 09.3	153	10 08.8	−116
23	351 11.7	126 56.1	48.4	63 44.4	44.0	233 01.2	03.0	135 09.0	00.2	159 43.6	153	10 20.4	−116
24	6 14.1	141 56.7	−21 49.1	78 45.4	−25 43.8	248 03.3	+21 02.9	150 11.2	−12 00.3	174 17.9	153	−10 32.0	−115
code	–	+ 6	− 8	+ 10	+ 2	+ 21	− 1	+ 22	− 1				

Day	GMT h	SUN GHA ° ′	SUN Dec. ° ′
25	0	182 00.3	− 0 33.2
	1	197 00.5	34.2
	2	212 00.7	35.2
	3	227 00.9 ••	36.1
	4	242 01.1	37.1
	5	257 01.3	38.1
	6	272 01.5	− 0 39.1
	7	287 01.8	40.0
	8	302 02.0	41.0
	9	317 02.2 ••	42.0
	10	332 02.4	43.0
	11	347 02.6	43.9
	12	2 02.8	− 0 44.9
	13	17 03.1	45.9
	14	32 03.3	46.9
	15	47 03.5 ••	47.8
	16	62 03.7	48.8
	17	77 03.9	49.8
	18	92 04.1	− 0 50.8
	19	107 04.3	51.7
	20	122 04.6	52.7
	21	137 04.8 ••	53.7
	22	152 05.0	54.7
	23	167 05.2	55.6
26	0	182 05.4	− 0 56.6
	1	197 05.6	57.6
	2	212 05.8	58.6
	3	227 06.1 •	0 59.5
	4	242 06.3	1 00.5
	5	257 06.5	01.5
	6	272 06.7	− 1 02.5
	7	287 06.9	03.4
	8	302 07.1	04.4
	9	317 07.3 ••	05.4
	10	332 07.5	06.4
	11	347 07.8	07.3
	12	2 08.0	− 1 08.3
	13	17 08.2	09.3
	14	32 08.4	10.3
	15	47 08.6 ••	11.2
	16	62 08.8	12.2
	17	77 09.0	13.2
	18	92 09.3	− 1 14.2
	19	107 09.5	15.1
	20	122 09.7	16.1
	21	137 09.9 ••	17.1
	22	152 10.1	18.1
	23	167 10.3	19.0
27	0	182 10.5	− 1 20.0
	1	197 10.7	21.0
	2	212 10.9	22.0
	3	227 11.2 ••	22.9
	4	242 11.4	23.9
	5	257 11.6	24.9
	6	272 11.8	− 1 25.9
	7	287 12.0	26.8
	8	302 12.2	27.8
	9	317 12.4 ••	28.8
	10	332 12.6	29.8
	11	347 12.9	30.7
	12	2 13.1	− 1 31.7
	13	17 13.3	32.7
	14	32 13.5	33.7
	15	47 13.7 ••	34.6
	16	62 13.9	35.6
	17	77 14.1	36.6
	18	92 14.3	− 1 37.5
	19	107 14.5	38.5
	20	122 14.7	39.5
	21	137 15.0 ••	40.5
	22	152 15.2	41.4
	23	167 15.4	42.4
	24	182 15.6	− 1 43.4
code		—	− 10

STARS No.	Name	SHA ° ′	Dec. ° ′
7	Acamar	315 51.3	−40 28.8
5	Achernar	335 58.7	−57 27.7
30	Acrux	173 59.5	−62 51.0
19	Adhara	255 47.2	−28 54.3
10	Aldebaran	291 39.8	+16 25.3
32	Alioth	166 59.6	+56 12.3
34	Alkaid	153 33.8	+49 32.4
55	Al Na'ir	28 38.4	−47 10.8
15	Alnilam	276 31.0	− 1 13.6
25	Alphard	218 39.6	− 8 27.6
41	Alphecca	126 48.5	+26 52.1
1	Alpheratz	358 28.8	+28 50.7
51	Altair	62 51.0	+ 8 45.0
2	Ankaa	353 58.5	−42 32.9
42	Antares	113 20.4	−26 20.1
37	Arcturus	146 36.1	+19 25.1
43	Atria	109 02.1	−68 57.1
22	Avior	234 36.5	−59 21.5
13	Bellatrix	279 19.2	+ 6 18.8
16	Betelg'se	271 48.9	+ 7 24.2
17	Canopus	264 15.7	−52 39.8
12	Capella	281 39.4	+45 57.2
53	Deneb	50 01.3	+45 07.4
28	Denebola	183 18.8	+14 49.5
4	Diphda	349 39.6	−18 13.8
27	Dubhe	194 46.0	+61 59.6
14	Elnath	279 08.2	+28 34.3
47	Eltanin	91 06.6	+51 29.9
54	Enif	34 30.1	+ 9 40.2
56	Fomalhaut	16 12.1	−29 51.6
31	Gacrux	172 50.7	−56 51.6
29	Gienah	176 38.0	−17 17.4
35	Hadar	149 51.1	−60 09.5
6	Hamal	328 50.2	+23 15.1
48	Kaus Aust.	84 42.1	−34 24.6
40	Kochab	137 18.6	+74 20.6
57	Markab	14 21.9	+14 57.9
8	Menkar	315 00.9	+ 3 55.0
36	Menkent	148 59.9	−36 09.0
24	Miapl'dus	221 50.0	−69 31.6
9	Mirfak	309 43.2	+49 42.1
50	Nunki	76 52.7	−26 21.3
52	Peacock	54 28.1	−56 53.0
21	Pollux	244 21.6	+28 08.2
20	Procyon	245 45.9	+ 5 20.6
46	R'alhague	96 47.4	+12 35.6
26	Regulus	208 30.6	+12 11.4
11	Rigel	281 54.3	− 8 14.9
38	Rigil Kent.	140 52.6	−60 39.2
44	Sabik	103 03.1	−15 40.2
3	Schedar	350 30.4	+56 17.5
45	Shaula	97 21.8	−37 04.5
18	Sirius	259 12.5	−16 38.9
33	Spica	159 18.0	−10 55.5
23	Suhail	223 25.2	−43 14.7
49	Vega	81 08.7	+38 44.7
39	Zub'g'bi	137 54.4	−15 51.3

Lat. °	Sunrise h m	Twlt. begins h m	Moonrise 25 h m	Moonrise 26 h m	Moonrise 27 h m	Moonrise 28 h m
N 72	5 54	1 03	3 41	5 35	7 28	9 30
70	5 54	1 53	3 47	5 32	7 17	9 07
68	5 53	2 23	3 51	5 30	7 08	8 49
66	5 53	2 45	3 54	5 28	7 00	8 34
64	5 53	3 02	3 58	5 26	6 54	8 23
62	5 53	3 15	4 00	5 25	6 49	8 13
60	5 52	3 26	4 02	5 24	6 44	8 04
58	5 52	3 35	4 05	5 23	6 40	7 57
56	5 52	3 43	4 06	5 22	6 36	7 51
54	5 52	3 50	4 08	5 21	6 33	7 45
52	5 52	3 56	4 09	5 20	6 30	7 40
50	5 52	4 01	4 11	5 19	6 27	7 35
45	5 51	4 12	4 14	5 18	6 22	7 25
40	5 51	4 20	4 16	5 17	6 17	7 17
35	5 51	4 26	4 18	5 16	6 13	7 09
30	5 50	4 30	4 20	5 15	6 09	7 03
20	5 50	4 36	4 23	5 13	6 03	6 53
10	5 49	4 39	4 26	5 12	5 57	6 43
0	5 48	4 40	4 28	5 11	5 52	6 35
10	5 47	4 38	4 31	5 09	5 47	6 26
20	5 46	4 34	4 34	5 08	5 42	6 17
30	5 45	4 26	4 37	5 07	5 36	6 06
35	5 44	4 21	4 39	5 06	5 33	6 00
40	5 44	4 14	4 41	5 05	5 29	5 54
45	5 43	4 05	4 43	5 04	5 24	5 46
50	5 41	3 52	4 46	5 02	5 19	5 36
52	5 41	3 47	4 47	5 02	5 16	5 32
54	5 40	3 41	4 49	5 01	5 14	5 27
56	5 39	3 32	4 50	5 01	5 11	5 22
58	5 38	3 23	4 52	5 00	5 08	5 16
S 60	5 38	3 13	4 54	4 59	5 04	5 10

Lat. °	Sunset h m	Twlt. ends h m	Moonset 25 h m	Moonset 26 h m	Moonset 27 h m	Moonset 28 h m
N 72	17 47	22 24	16 59	16 36	16 11	15 39
70	17 47	21 40	16 58	16 42	16 25	16 04
68	17 48	21 12	16 57	16 47	16 36	16 23
66	17 48	20 52	16 56	16 51	16 45	16 39
64	17 49	20 36	16 56	16 54	16 53	16 51
62	17 49	20 23	16 55	16 57	16 59	17 02
60	17 49	20 13	16 55	17 00	17 05	17 12
58	17 50	20 04	16 54	17 02	17 10	17 20
56	17 50	19 57	16 54	17 04	17 15	17 27
54	17 50	19 50	16 54	17 06	17 19	17 34
52	17 50	19 44	16 53	17 08	17 23	17 39
50	17 51	19 40	16 53	17 09	17 26	17 45
45	17 51	19 29	16 52	17 13	17 34	17 56
40	17 52	19 22	16 52	17 16	17 40	18 06
35	17 52	19 16	16 51	17 18	17 45	18 14
30	17 52	19 12	16 51	17 20	17 50	18 21
20	17 53	19 06	16 50	17 24	17 58	18 34
10	17 54	19 04	16 49	17 28	18 06	18 45
0	17 55	19 04	16 49	17 31	18 13	18 55
10	17 56	19 06	16 48	17 34	18 19	19 06
20	17 57	19 10	16 47	17 37	18 27	19 17
30	17 58	19 18	16 46	17 41	18 35	19 30
35	17 59	19 24	16 46	17 43	18 40	19 37
40	18 00	19 31	16 45	17 46	18 46	19 45
45	18 01	19 41	16 45	17 49	18 52	19 55
50	18 03	19 54	16 44	17 52	19 00	20 08
52	18 03	19 59	16 43	17 54	19 04	20 13
54	18 04	20 07	16 43	17 56	19 08	20 19
56	18 05	20 15	16 43	17 58	19 12	20 26
58	18 06	20 25	16 42	18 00	19 17	20 34
S 60	18 07	20 36	16 41	18 02	19 22	20 43

Equation of Time (App.—Mean)

GMT h	25 m s	26 m s	27 m s
0	+ 8 00.6	+ 8 21.2	+ 8 41.7
6	+ 8 05.8	+ 8 26.4	+ 8 46.8
12	+ 8 10.9	+ 8 31.5	+ 8 51.8
18	+ 8 16.1	+ 8 36.6	+ 8 56.9
24	+ 8 21.2	+ 8 41.7	+ 9 01.9

GMT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
25	10 39	14 35	18 48	7 37	14 08
26	11 21	14 34	18 47	7 33	14 04
27	12 02	14 33	18 45	7 30	14 01
28	12 45	14 32	18 44	7 27	13 57

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0			
30	0.3	0.3	0.2
45	0.3	0.2	0.2
60	0.3	0.2	0.1
75	0.3	0.1	0.1
90	0.3	0.0	0.0

Moon's Lower Limb Add

Alt. °	25 ′	26 ′	27 ′
0	13.3	12.8	12.4
4	13.3	12.8	12.4
8	13.3	12.8	12.4
12	13.3	12.8	12.4
16	13.3	12.9	12.5
20	13.4	12.9	12.6
24	13.4	13.0	12.6
28	13.5	13.0	12.7
32	13.6	13.1	12.8
36	13.6	13.2	12.9
40	13.7	13.3	13.0
44	13.8	13.4	13.1
48	13.9	13.5	13.3
52	14.0	13.7	13.4
56	14.1	13.8	13.5
60	14.2	13.9	13.7
64	14.3	14.1	13.9
68	14.4	14.2	14.0
72	14.6	14.3	14.2
76	14.7	14.5	14.4
80	14.8	14.6	14.5
84	14.9	14.8	14.7
88	15.0	14.9	14.8
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt. °	25 ′	26 ′	27 ′
0	16.9	17.2	17.4
4	16.8	17.1	17.4
8	16.8	17.1	17.3
12	16.8	17.1	17.3
16	16.8	17.0	17.2
20	16.7	17.0	17.2
24	16.7	16.9	17.1
28	16.6	16.9	17.0
32	16.6	16.8	16.9
36	16.5	16.7	16.8
40	16.4	16.6	16.7
44	16.3	16.5	16.6
48	16.2	16.4	16.5
52	16.1	16.2	16.3
56	16.0	16.1	16.2
60	15.9	16.0	16.0
64	15.8	15.8	15.9
68	15.7	15.7	15.7
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.3	15.3	15.2
84	15.2	15.1	15.0
88	15.1	15.0	14.9
90			

Subtract from table, back cover

New Moon 27

992941°—53——11

GMT	♈ GHA	VENUS −4.2 GHA	Dec.	MARS −0.4 GHA	Dec.	JUPITER −1.7 GHA	Dec.	SATURN 0.9 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
28 0	6 14.1	141 56.7	−21 49.1	78 45.4	−25 43.8	248 03.3	+21 02.9	150 11.2	−12 00.3	174 17.9	153	−10 32.0	−115
1	21 16.6	156 57.3	49.9	93 46.3	43.5	263 05.4	02.9	165 13.5	00.4	188 52.2	152	10 43.5	−115
2	36 19.0	171 58.0	50.6	108 47.2	43.3	278 07.5	02.8	180 15.7	00.5	203 26.4	152	10 55.0	−115
3	51 21.5	186 58.6	·· 51.4	123 48.2	·· 43.0	293 09.6	·· 02.8	195 17.9	·· 00.5	218 00.6	152	·11 06.5	−113
4	66 24.0	201 59.2	52.1	138 49.1	42.8	308 11.7	02.7	210 20.1	00.6	232 34.8	151	11 17.8	−114
5	81 26.4	216 59.9	52.9	153 50.0	42.5	323 13.8	02.6	225 22.3	00.7	247 08.9	152	11 29.2	−113
6	96 28.9	232 00.5	−21 53.6	168 50.9	−25 42.3	338 15.9	+21 02.6	240 24.5	−12 00.8	261 43.1	151	−11 40.5	−112
7	111 31.4	247 01.2	54.4	183 51.9	42.0	353 18.0	02.5	255 26.7	00.9	276 17.2	150	11 51.7	−112
8	126 33.8	262 01.8	55.1	198 52.8	41.8	8 20.1	02.5	270 28.9	01.0	290 51.2	151	12 02.9	−111
9	141 36.3	277 02.4	·· 55.9	213 53.7	·· 41.5	23 22.2	·· 02.4	285 31.1	·· 01.1	305 25.3	150	·12 14.0	−111
10	156 38.8	292 03.1	56.6	228 54.6	41.3	38 24.3	02.3	300 33.3	01.2	319 59.3	150	12 25.1	−110
11	171 41.2	307 03.7	57.4	243 55.6	41.0	53 26.4	02.3	315 35.5	01.3	334 33.3	149	12 36.1	−110
12	186 43.7	322 04.4	−21 58.1	258 56.5	−25 40.8	68 28.5	+21 02.2	330 37.7	−12 01.4	349 07.2	150	−12 47.1	−109
13	201 46.1	337 05.0	58.9	273 57.4	40.5	83 30.6	02.2	345 39.9	01.5	3 41.2	149	12 58.0	−108
14	216 48.6	352 05.7	21 59.6	288 58.3	40.3	98 32.7	02.1	0 42.1	01.5	18 15.1	148	13 08.8	−108
15	231 51.1	7 06.3	·22 00.4	303 59.3	·· 40.0	113 34.8	·· 02.0	15 44.3	·· 01.6	32 48.9	149	·13 19.6	−108
16	246 53.5	22 07.0	01.1	319 00.2	39.8	128 36.8	02.0	30 46.6	01.7	47 22.8	148	13 30.4	−107
17	261 56.0	37 07.6	01.8	334 01.1	39.5	143 38.9	01.9	45 48.8	01.8	61 56.6	147	13 41.1	−106
18	276 58.5	52 08.3	−22 02.6	349 02.0	−25 39.3	158 41.0	+21 01.9	60 51.0	−12 01.9	76 30.3	148	−13 51.7	−105
19	292 00.9	67 08.9	03.3	4 02.9	39.0	173 43.1	01.8	75 53.2	02.0	91 04.1	147	14 02.2	−105
20	307 03.4	82 09.6	04.1	19 03.9	38.7	188 45.2	01.7	90 55.4	02.1	105 37.8	146	14 12.7	−105
21	322 05.9	97 10.2	·· 04.8	34 04.8	·· 38.5	203 47.3	·· 01.7	105 57.6	·· 02.2	120 11.4	147	·14 23.2	−104
22	337 08.3	112 10.9	05.5	49 05.7	38.2	218 49.4	01.6	120 59.8	02.3	134 45.1	146	14 33.6	−103
23	352 10.8	127 11.6	06.3	64 06.6	38.0	233 51.5	01.6	136 02.0	02.4	149 18.7	145	14 43.9	−102
29 0	7 13.3	142 12.2	−22 07.0	79 07.5	−25 37.7	248 53.6	+21 01.5	151 04.2	−12 02.5	163 52.2	145	−14 54.1	−102
1	22 15.7	157 12.9	07.7	94 08.5	37.5	263 55.7	01.4	166 06.4	02.6	178 25.7	145	15 04.3	−101
2	37 18.2	172 13.5	08.5	109 09.4	37.2	278 57.8	01.4	181 08.6	02.6	192 59.2	145	15 14.4	−101
3	52 20.6	187 14.2	·· 09.2	124 10.3	·· 37.0	293 59.9	·· 01.3	196 10.8	·· 02.7	207 32.7	144	·15 24.5	−100
4	67 23.1	202 14.9	09.9	139 11.2	36.7	309 02.0	01.3	211 13.0	02.8	222 06.1	143	15 34.5	− 99
5	82 25.6	217 15.6	10.7	154 12.1	36.4	324 04.1	01.2	226 15.2	02.9	236 39.4	144	15 44.4	− 99
6	97 28.0	232 16.2	−22 11.4	169 13.0	−25 36.2	339 06.2	+21 01.1	241 17.4	−12 03.0	251 12.8	143	−15 54.3	− 97
7	112 30.5	247 16.9	12.1	184 14.0	35.9	354 08.3	01.1	256 19.6	03.1	265 46.1	142	16 04.0	− 98
8	127 33.0	262 17.6	12.9	199 14.9	35.7	9 10.4	01.0	271 21.8	03.2	280 19.3	142	16 13.8	− 96
9	142 35.4	277 18.2	·· 13.6	214 15.8	·· 35.4	24 12.5	·· 01.0	286 24.0	·· 03.3	294 52.5	142	·16 23.4	− 96
10	157 37.9	292 18.9	14.3	229 16.7	35.2	39 14.6	00.9	301 26.3	03.4	309 25.7	142	16 33.0	− 95
11	172 40.4	307 19.6	15.0	244 17.6	34.9	54 16.7	00.8	316 28.5	03.5	323 58.9	140	16 42.5	− 94
12	187 42.8	322 20.3	−22 15.8	259 18.5	−25 34.6	69 18.8	+21 00.8	331 30.7	−12 03.6	338 31.9	141	−16 51.9	− 94
13	202 45.3	337 21.0	16.5	274 19.4	34.4	84 20.9	00.7	346 32.9	03.7	353 05.0	140	17 01.3	− 93
14	217 47.8	352 21.6	17.2	289 20.4	34.1	99 23.0	00.7	1 35.1	03.7	7 38.0	140	17 10.6	− 92
15	232 50.2	7 22.3	·· 17.9	304 21.3	·· 33.9	114 25.1	·· 00.6	16 37.3	·· 03.8	22 11.0	139	·17 19.8	− 91
16	247 52.7	22 23.0	18.7	319 22.2	33.6	129 27.2	00.5	31 39.5	03.9	36 43.9	139	17 28.9	− 91
17	262 55.1	37 23.7	19.4	334 23.1	33.3	144 29.3	00.5	46 41.7	04.0	51 16.8	138	17 38.0	− 90
18	277 57.6	52 24.4	−22 20.1	349 24.0	−25 33.1	159 31.4	+21 00.4	61 43.9	−12 04.1	65 49.6	138	−17 47.0	− 89
19	293 00.1	67 25.1	20.8	4 24.9	32.8	174 33.5	00.4	76 46.1	04.2	80 22.4	138	17 55.9	− 88
20	308 02.5	82 25.8	21.5	19 25.8	32.6	189 35.6	00.3	91 48.3	04.3	94 55.2	137	18 04.7	− 88
21	323 05.0	97 26.4	·· 22.2	34 26.7	·· 32.3	204 37.8	·· 00.2	106 50.5	·· 04.4	109 27.9	137	·18 13.5	− 87
22	338 07.5	112 27.1	23.0	49 27.6	32.0	219 39.9	00.2	121 52.7	04.5	124 00.6	136	18 22.2	− 86
23	353 09.9	127 27.8	23.7	64 28.6	31.8	234 42.0	00.1	136 54.9	04.6	138 33.2	136	18 30.8	− 85
30 0	8 12.4	142 28.5	−22 24.4	79 29.5	−25 31.5	249 44.1	+21 00.1	151 57.1	−12 04.7	153 05.8	135	−18 39.3	− 84
1	23 14.9	157 29.2	25.1	94 30.4	31.2	264 46.2	21 00.0	166 59.3	04.8	167 38.3	135	18 47.7	− 84
2	38 17.3	172 29.9	25.8	109 31.3	31.0	279 48.3	20 59.9	182 01.5	04.8	182 10.8	134	18 56.1	− 82
3	53 19.8	187 30.6	·· 26.5	124 32.2	·· 30.7	294 50.4	·· 59.9	197 03.7	·· 04.9	196 43.2	135	·19 04.3	− 82
4	68 22.2	202 31.3	27.2	139 33.1	30.4	309 52.5	59.8	212 05.9	05.0	211 15.7	133	19 12.5	− 81
5	83 24.7	217 32.0	28.0	154 34.0	30.2	324 54.6	59.8	227 08.1	05.1	225 48.0	133	19 20.6	− 81
6	98 27.2	232 32.7	−22 28.7	169 34.9	−25 29.9	339 56.7	+20 59.7	242 10.3	−12 05.2	240 20.3	133	−19 28.7	− 79
7	113 29.6	247 33.4	29.4	184 35.8	29.7	354 58.8	59.6	257 12.5	05.3	254 52.6	132	19 36.6	− 78
8	128 32.1	262 34.1	30.1	199 36.7	29.4	10 00.9	59.6	272 14.7	05.4	269 24.8	132	19 44.4	− 78
9	143 34.6	277 34.9	·· 30.8	214 37.6	·· 29.1	25 03.0	·· 59.5	287 16.9	·· 05.5	283 57.0	131	·19 52.2	− 77
10	158 37.0	292 35.6	31.5	229 38.5	28.9	40 05.1	59.5	302 19.2	05.6	298 29.1	131	19 59.9	− 76
11	173 39.5	307 36.3	32.2	244 39.4	28.6	55 07.2	59.4	317 21.4	05.7	313 01.2	130	20 07.5	− 75
12	188 42.0	322 37.0	−22 32.9	259 40.3	−25 28.3	70 09.3	+20 59.4	332 23.6	−12 05.8	327 33.2	130	−20 15.0	− 74
13	203 44.4	337 37.7	33.6	274 41.2	28.1	85 11.4	59.3	347 25.8	05.9	342 05.2	130	20 22.4	− 73
14	218 46.9	352 38.4	34.3	289 42.1	27.8	100 13.6	59.2	2 28.0	05.9	356 37.2	129	20 29.7	− 73
15	233 49.4	7 39.1	·· 35.0	304 43.0	·· 27.5	115 15.7	·· 59.2	17 30.2	·· 06.0	11 09.1	128	·20 37.0	− 71
16	248 51.8	22 39.9	35.7	319 43.9	27.3	130 17.8	59.1	32 32.4	06.1	25 40.9	128	20 44.1	− 71
17	263 54.3	37 40.6	36.4	334 44.9	27.0	145 19.9	59.1	47 34.6	06.2	40 12.7	128	20 51.2	− 69
18	278 56.7	52 41.3	−22 37.1	349 45.8	−25 26.7	160 22.0	+20 59.0	62 36.8	−12 06.3	54 44.5	127	−20 58.1	− 69
19	293 59.2	67 42.0	37.8	4 46.7	26.5	175 24.1	58.9	77 39.0	06.4	69 16.2	127	21 05.0	− 68
20	309 01.7	82 42.8	38.5	19 47.6	26.2	190 26.2	58.9	92 41.2	06.5	83 47.9	126	21 11.8	− 67
21	324 04.1	97 43.5	·· 39.2	34 48.5	·· 25.9	205 28.3	·· 58.8	107 43.4	·· 06.6	98 19.5	126	·21 18.5	− 65
22	339 06.6	112 44.2	39.9	49 49.4	25.6	220 30.4	58.8	122 45.6	06.7	112 51.1	125	21 25.0	− 65
23	354 09.1	127 44.9	40.6	64 50.3	25.4	235 32.5	58.7	137 47.8	06.8	127 22.6	125	21 31.5	− 64
24	9 11.5	142 45.7	−22 41.3	79 51.2	−25 25.1	250 34.6	+20 58.6	152 50.0	−12 06.9	141 54.1	125	−21 37.9	− 63
code	—	+ 7	− 7	+ 9	+ 2	+ 21	− 1	+ 22	− 1				

GMT		SUN GHA	SUN Dec.
	h	° ′	° ′
28	0	182 15.6	− 1 43.4
	1	197 15.8	44.4
	2	212 16.0	45.3
	3	227 16.2 ••	46.3
	4	242 16.4	47.3
	5	257 16.6	48.3
	6	272 16.8	− 1 49.2
	7	287 17.1	50.2
	8	302 17.3	51.2
	9	317 17.5 ••	52.2
	10	332 17.7	53.1
	11	347 17.9	54.1
	12	2 18.1	− 1 55.1
	13	17 18.3	56.1
	14	32 18.5	57.0
	15	47 18.7 ••	58.0
	16	62 18.9	1 59.0
	17	77 19.1	2 00.0
	18	92 19.4	− 2 00.9
	19	107 19.6	01.9
	20	122 19.8	02.9
	21	137 20.0 ••	03.8
	22	152 20.2	04.8
	23	167 20.4	05.8
29	0	182 20.6	− 2 06.8
	1	197 20.8	07.7
	2	212 21.0	08.7
	3	227 21.2 ••	09.7
	4	242 21.4	10.7
	5	257 21.6	11.6
	6	272 21.8	− 2 12.6
	7	287 22.0	13.6
	8	302 22.3	14.6
	9	317 22.5 ••	15.5
	10	332 22.7	16.5
	11	347 22.9	17.5
	12	2 23.1	− 2 18.5
	13	17 23.3	19.4
	14	32 23.5	20.4
	15	47 23.7 ••	21.4
	16	62 23.9	22.3
	17	77 24.1	23.3
	18	92 24.3	− 2 24.3
	19	107 24.5	25.3
	20	122 24.7	26.2
	21	137 24.9 ••	27.2
	22	152 25.1	28.2
	23	167 25.3	29.2
30	0	182 25.6	− 2 30.1
	1	197 25.8	31.1
	2	212 26.0	32.1
	3	227 26.2 ••	33.0
	4	242 26.4	34.0
	5	257 26.6	35.0
	6	272 26.8	− 2 36.0
	7	287 27.0	36.9
	8	302 27.2	37.9
	9	317 27.4 ••	38.9
	10	332 27.6	39.9
	11	347 27.8	40.8
	12	2 28.0	− 2 41.8
	13	17 28.2	42.8
	14	32 28.4	43.7
	15	47 28.6 ••	44.7
	16	62 28.8	45.7
	17	77 29.0	46.7
	18	92 29.2	− 2 47.6
	19	107 29.4	48.6
	20	122 29.6	49.6
	21	137 29.8 ••	50.5
	22	152 30.0	51.5
	23	167 30.2	52.5
	24	182 30.4	− 2 53.5
code		—	− 9

STARS No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.3	−40 28.8
5	Achernar	335 58.7	−57 27.7
30	Acrux	173 59.4	−62 51.0
19	Adhara	255 47.2	−28 54.3
10	Aldebaran	291 39.8	+16 25.3
32	Alioth	166 59.6	+56 12.3
34	Alkaid	153 33.8	+49 32.4
55	Al Na'ir	28 38.4	−47 10.8
15	Alnilam	276 31.0	− 1 13.6
25	Alphard	218 39.5	− 8 27.6
41	Alphecca	126 48.5	+26 52.1
1	Alpheratz	358 28.8	+28 50.7
51	Altair	62 51.0	+ 8 45.0
2	Ankaa	353 58.5	−42 32.9
42	Antares	113 20.5	−26 20.1
37	Arcturus	146 36.1	+19 25.1
43	Atria	109 02.1	−68 57.1
22	Avior	234 36.4	−59 21.5
13	Bellatrix	279 19.1	+ 6 18.8
16	Betelg'se	271 48.9	+ 7 24.2
17	Canopus	264 15.7	−52 39.9
12	Capella	281 39.4	+45 57.2
53	Deneb	50 01.3	+45 07.4
28	Denebola	183 18.8	+14 49.5
4	Diphda	349 39.6	−18 13.8
27	Dubhe	194 46.0	+61 59.6
14	Elnath	279 08.2	+28 34.3
47	Eltanin	91 06.7	+51 29.9
54	Enif	34 30.1	+ 9 40.2
56	Fomalhaut	16 12.1	−29 51.6
31	Gacrux	172 50.7	−56 51.6
29	Gienah	176 38.0	−17 17.4
35	Hadar	149 51.1	−60 09.5
6	Hamal	328 50.2	+23 15.1
48	Kaus Aust.	84 42.2	−34 24.6
40	Kochab	137 18.7	+74 20.5
57	Markab	14 21.9	+14 57.9
8	Menkar	315 00.8	+ 3 55.0
36	Menkent	148 59.9	−36 09.0
24	Miapl'dus	221 49.9	−69 31.6
9	Mirfak	309 43.1	+49 42.1
50	Nunki	76 52.8	−26 21.3
52	Peacock	54 28.1	−56 53.0
21	Pollux	244 21.6	+28 08.2
20	Procyon	245 45.8	+ 5 20.6
46	R'alhague	96 47.4	+12 35.6
26	Regulus	208 30.5	+12 11.4
11	Rigel	281 54.2	− 8 14.9
38	Rigil Kent.	140 52.6	−60 39.2
44	Sabik	103 03.1	−15 40.2
3	Schedar	350 30.3	+56 17.5
45	Shaula	97 21.8	−37 04.5
18	Sirius	259 12.5	−16 38.9
33	Spica	159 18.0	−10 55.5
23	Suhail	223 25.2	−43 14.7
49	Vega	81 08.8	+38 44.7
39	Zub'g'bi	137 54.5	−15 51.3

Lat.	Sunrise	Twlt. begins	Moonrise 28	Moonrise 29	Moonrise 30	Moonrise 1
N °	h m	h m	h m	h m	h m	h m
72	6 07	1 38	9 30	12 06	■	■
70	6 05	2 14	9 07	11 09	■	■
68	6 04	2 39	8 49	10 36	12 40	■
66	6 02	2 58	8 34	10 12	11 55	13 50
64	6 01	3 12	8 23	9 53	11 26	12 59
62	6 00	3 25	8 13	9 38	11 04	12 27
60	5 59	3 34	8 04	9 25	10 46	12 04
58	5 59	3 42	7 57	9 14	10 31	11 45
56	5 58	3 50	7 51	9 05	10 18	11 29
54	5 57	3 56	7 45	8 57	10 07	11 16
52	5 57	4 01	7 40	8 49	9 58	11 04
50	5 56	4 07	7 35	8 42	9 49	10 54
45	5 55	4 16	7 25	8 28	9 31	10 32
40	5 54	4 23	7 17	8 16	9 16	10 15
35	5 53	4 28	7 09	8 06	9 03	10 00
30	5 52	4 32	7 03	7 58	8 53	9 47
20	5 50	4 37	6 53	7 43	8 34	9 26
10	5 49	4 39	6 43	7 30	8 18	9 07
0	5 47	4 39	6 35	7 18	8 03	8 50
10	5 46	4 36	6 26	7 06	7 48	8 32
20	5 44	4 31	6 17	6 53	7 32	8 14
30	5 42	4 23	6 06	6 39	7 14	7 53
35	5 40	4 17	6 00	6 30	7 03	7 41
40	5 39	4 08	5 54	6 21	6 51	7 26
45	5 37	3 59	5 46	6 10	6 37	7 10
50	5 35	3 46	5 36	5 56	6 20	6 49
52	5 34	3 39	5 32	5 50	6 12	6 39
54	5 33	3 31	5 27	5 43	6 03	6 28
56	5 31	3 23	5 22	5 36	5 53	6 16
58	5 30	3 13	5 16	5 27	5 41	6 01
60	5 28	3 00	5 10	5 18	5 28	5 44
S						

Lat.	Sunset	Twlt. ends	Moonset 28	Moonset 29	Moonset 30	Moonset 1
N °	h m	h m	h m	h m	h m	h m
72	17 31	21 51	15 39	14 34	■	■
70	17 33	21 17	16 04	15 32	■	■
68	17 35	20 54	16 23	16 07	15 37	■
66	17 37	20 37	16 39	16 32	16 22	16 06
64	17 38	20 23	16 51	16 51	16 52	16 57
62	17 39	20 11	17 02	17 07	17 15	17 29
60	17 40	20 02	17 12	17 21	17 33	17 53
58	17 41	19 54	17 20	17 32	17 49	18 12
56	17 42	19 48	17 27	17 42	18 02	18 28
54	17 43	19 42	17 34	17 51	18 13	18 42
52	17 43	19 36	17 39	17 59	18 23	18 54
50	17 44	19 32	17 45	18 06	18 32	19 05
45	17 45	19 23	17 56	18 22	18 51	19 27
40	17 47	19 17	18 06	18 34	19 07	19 45
35	17 48	19 12	18 14	18 45	19 20	20 00
30	17 49	19 08	18 21	18 55	19 32	20 13
20	17 50	19 03	18 34	19 11	19 52	20 35
10	17 52	19 02	18 45	19 26	20 09	20 55
0	17 54	19 03	18 55	19 39	20 25	21 13
10	17 56	19 06	19 06	19 53	20 42	21 31
20	17 58	19 12	19 17	20 07	20 59	21 51
30	18 00	19 20	19 30	20 24	21 19	22 13
35	18 01	19 26	19 37	20 34	21 31	22 27
40	18 03	19 35	19 45	20 45	21 44	22 42
45	18 05	19 45	19 55	20 58	22 00	23 00
50	18 07	19 59	20 08	21 15	22 20	23 23
52	18 08	20 06	20 13	21 22	22 30	23 34
54	18 10	20 14	20 19	21 31	22 40	23 46
56	18 11	20 23	20 26	21 40	22 52	24 00
58	18 12	20 33	20 34	21 51	23 06	24 17
60	18 14	20 46	20 43	22 04	23 23	24 37
S						

GMT	Equation of Time (App.—Mean) 28	29	30
h	m s	m s	m s
0	+ 9 01.9	+ 9 22.0	+ 9 41.8
6	+ 9 07.0	+ 9 27.0	+ 9 46.7
12	+ 9 12.0	+ 9 31.9	+ 9 51.6
18	+ 9 17.0	+ 9 36.9	+ 9 56.5
24	+ 9 22.0	+ 9 41.8	+10 01.4

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
28	12 45	14 32	18 44	7 27	13 57
29	13 29	14 31	18 42	7 23	13 54
30	14 14	14 29	18 41	7 20	13 50
1	15 01	14 28	18 40	7 17	13 47

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.3	0.3	0.2
30			
	0.3	0.2	0.2
45			
	0.3	0.2	0.1
60			
	0.3	0.1	0.1
75			
	0.3	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	28	29	30
°	′	′	′
0			
	12.0	11.9	11.7
4			
	12.0	11.9	11.7
8			
	12.0	11.9	11.8
12			
	12.1	11.9	11.8
16			
	12.1	12.0	11.9
20			
	12.2	12.1	12.0
24			
	12.3	12.2	12.0
28			
	12.4	12.2	12.1
32			
	12.5	12.4	12.2
36			
	12.6	12.5	12.4
40			
	12.7	12.6	12.5
44			
	12.8	12.7	12.6
48			
	13.0	12.9	12.8
52			
	13.1	13.1	13.0
56			
	13.3	13.2	13.1
60			
	13.5	13.4	13.3
64			
	13.6	13.6	13.5
68			
	13.8	13.8	13.7
72			
	14.0	14.0	13.9
76			
	14.2	14.2	14.1
80			
	14.4	14.4	14.3
84			
	14.6	14.6	14.5
88			
	14.7	14.7	14.7
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	28	29	30
°	′	′	′
0			
	17.6	17.7	17.7
4			
	17.6	17.6	17.7
8			
	17.5	17.6	17.7
12			
	17.5	17.6	17.6
16			
	17.5	17.5	17.6
20			
	17.4	17.5	17.5
24			
	17.3	17.4	17.4
28			
	17.2	17.3	17.3
32			
	17.1	17.2	17.2
36			
	17.0	17.0	17.1
40			
	16.9	16.9	17.0
44			
	16.7	16.8	16.8
48			
	16.6	16.6	16.7
52			
	16.4	16.5	16.5
56			
	16.3	16.3	16.3
60			
	16.1	16.1	16.1
64			
	15.9	15.9	16.0
68			
	15.7	15.8	15.8
72			
	15.6	15.6	15.6
76			
	15.4	15.4	15.4
80			
	15.2	15.2	15.2
84			
	15.0	15.0	14.9
88			
	14.8	14.8	14.8
90			

Subtract from table, back cover

Hebrew New Year (Rosh Hashanah) 28

GMT	♈ GHA	VENUS −4.3 GHA	VENUS Dec.	MARS −0.4 GHA	MARS Dec.	JUPITER −1.7 GHA	JUPITER Dec.	SATURN 0.9 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
1 0	9 11.5	142 45.7	−22 41.3	79 51.2	−25 25.1	250 34.6	+20 58.6	152 50.0	−12 06.9	141 54.1	125	−21 37.9	−63
1	24 14.0	157 46.4	42.0	94 52.1	24.8	265 36.8	58.6	167 52.2	07.0	156 25.6	124	21 44.2	−63
2	39 16.5	172 47.1	42.7	109 53.0	24.6	280 38.9	58.5	182 54.4	07.1	170 57.0	123	21 50.5	−61
3	54 18.9	187 47.9	·· 43.4	124 53.8	·· 24.3	295 41.0	·· 58.5	197 56.6	·· 07.1	185 28.3	124	·21 56.6	−60
4	69 21.4	202 48.6	44.0	139 54.7	24.0	310 43.1	58.4	212 58.8	07.2	199 59.7	122	22 02.6	−59
5	84 23.9	217 49.4	44.7	154 55.6	23.8	325 45.2	58.4	228 01.0	07.3	214 30.9	122	22 08.5	−58
6	99 26.3	232 50.1	−22 45.4	169 56.5	−25 23.5	340 47.3	+20 58.3	243 03.2	−12 07.4	229 02.1	122	−22 14.3	−57
7	114 28.8	247 50.9	46.1	184 57.4	23.2	355 49.4	58.2	258 05.4	07.5	243 33.3	121	22 20.0	−56
8	129 31.2	262 51.6	46.8	199 58.3	22.9	10 51.5	58.2	273 07.6	07.6	258 04.4	121	22 25.6	−55
9	144 33.7	277 52.3	·· 47.5	214 59.2	·· 22.7	25 53.6	·· 58.1	288 09.8	·· 07.7	272 35.5	121	·22 31.1	−54
10	159 36.2	292 53.1	48.2	230 00.1	22.4	40 55.8	58.1	303 12.0	07.8	287 06.6	120	22 36.5	−54
11	174 38.6	307 53.8	48.8	245 01.0	22.1	55 57.9	58.0	318 14.2	07.9	301 37.6	119	22 41.9	−52
12	189 41.1	322 54.6	−22 49.5	260 01.9	−25 21.8	71 00.0	+20 57.9	333 16.4	−12 08.0	316 08.5	120	−22 47.1	−51
13	204 43.6	337 55.3	50.2	275 02.8	21.6	86 02.1	57.9	348 18.6	08.1	330 39.5	118	22 52.2	−50
14	219 46.0	352 56.1	50.9	290 03.7	21.3	101 04.2	57.8	3 20.8	08.2	345 10.3	119	22 57.2	−49
15	234 48.5	7 56.9	·· 51.6	305 04.6	·· 21.0	116 06.3	·· 57.8	18 23.0	·· 08.3	359 41.2	117	·23 02.1	−47
16	249 51.0	22 57.6	52.2	320 05.5	20.8	131 08.4	57.7	33 25.2	08.3	14 11.9	118	23 06.8	−47
17	264 53.4	37 58.4	52.9	335 06.4	20.5	146 10.6	57.7	48 27.4	08.4	28 42.7	117	23 11.5	−46
18	279 55.9	52 59.1	−22 53.6	350 07.3	−25 20.2	161 12.7	+20 57.6	63 29.6	−12 08.5	43 13.4	117	−23 16.1	−45
19	294 58.3	67 59.9	54.3	5 08.2	19.9	176 14.8	57.5	78 31.8	08.6	57 44.1	116	23 20.6	−44
20	310 00.8	83 00.7	55.0	20 09.1	19.7	191 16.9	57.5	93 34.0	08.7	72 14.7	116	23 25.0	−42
21	325 03.3	98 01.4	·· 55.6	35 09.9	·· 19.4	206 19.0	·· 57.4	108 36.2	·· 08.8	86 45.3	115	·23 29.2	−42
22	340 05.7	113 02.2	56.3	50 10.8	19.1	221 21.1	57.4	123 38.4	08.9	101 15.8	115	23 33.4	−40
23	355 08.2	128 03.0	57.0	65 11.7	18.8	236 23.2	57.3	138 40.6	09.0	115 46.3	115	23 37.4	−39
2 0	10 10.7	143 03.7	−22 57.6	80 12.6	−25 18.5	251 25.4	+20 57.2	153 42.8	−12 09.1	130 16.8	114	−23 41.3	−39
1	25 13.1	158 04.5	58.3	95 13.5	18.3	266 27.5	57.2	168 45.0	09.2	144 47.2	114	23 45.2	−37
2	40 15.6	173 05.3	59.0	110 14.4	18.0	281 29.6	57.1	183 47.2	09.3	159 17.6	113	23 48.9	−36
3	55 18.1	188 06.1	·22 59.7	125 15.3	·· 17.7	296 31.7	·· 57.1	198 49.4	·· 09.4	173 47.9	114	·23 52.5	−35
4	70 20.5	203 06.8	23 00.3	140 16.2	17.4	311 33.8	57.0	213 51.6	09.5	188 18.3	112	23 56.0	−34
5	85 23.0	218 07.6	01.0	155 17.1	17.2	326 35.9	57.0	228 53.8	09.5	202 48.5	113	23 59.4	−33
6	100 25.5	233 08.4	−23 01.7	170 18.0	−25 16.9	341 38.1	+20 56.9	243 56.0	−12 09.6	217 18.8	112	−24 02.7	−31
7	115 27.9	248 09.2	02.3	185 18.8	16.6	356 40.2	56.8	258 58.2	09.7	231 49.0	112	24 05.8	−31
8	130 30.4	263 10.0	03.0	200 19.7	16.3	11 42.3	56.8	274 00.4	09.8	246 19.2	111	24 08.9	−29
9	145 32.8	278 10.7	·· 03.6	215 20.6	·· 16.0	26 44.4	·· 56.7	289 02.6	·· 09.9	260 49.3	111	·24 11.8	−28
10	160 35.3	293 11.5	04.3	230 21.5	15.8	41 46.5	56.7	304 04.8	10.0	275 19.4	111	24 14.6	−27
11	175 37.8	308 12.3	05.0	245 22.4	15.5	56 48.7	56.6	319 07.0	10.1	289 49.5	110	24 17.3	−26
12	190 40.2	323 13.1	−23 05.6	260 23.3	−25 15.2	71 50.8	+20 56.6	334 09.2	−12 10.2	304 19.5	110	−24 19.9	−25
13	205 42.7	338 13.9	06.3	275 24.2	14.9	86 52.9	56.5	349 11.4	10.3	318 49.5	110	24 22.4	−24
14	220 45.2	353 14.7	07.0	290 25.0	14.6	101 55.0	56.4	4 13.6	10.4	333 19.5	109	24 24.8	−22
15	235 47.6	8 15.5	·· 07.6	305 25.9	·· 14.4	116 57.1	·· 56.4	19 15.8	·· 10.5	347 49.4	109	·24 27.0	−22
16	250 50.1	23 16.3	08.3	320 26.8	14.1	131 59.3	56.3	34 18.0	10.6	2 19.3	109	24 29.2	−20
17	265 52.6	38 17.1	08.9	335 27.7	13.8	147 01.4	56.3	49 20.2	10.7	16 49.2	108	24 31.2	−19
18	280 55.0	53 17.9	−23 09.6	350 28.6	−25 13.5	162 03.5	+20 56.2	64 22.4	−12 10.7	31 19.0	108	−24 33.1	−18
19	295 57.5	68 18.7	10.2	5 29.5	13.2	177 05.6	56.2	79 24.6	10.8	45 48.8	108	24 34.9	−17
20	311 00.0	83 19.5	10.9	20 30.3	12.9	192 07.7	56.1	94 26.8	10.9	60 18.6	108	24 36.6	−15
21	326 02.4	98 20.3	·· 11.5	35 31.2	·· 12.7	207 09.9	·· 56.0	109 29.0	·· 11.0	74 48.4	107	·24 38.1	−14
22	341 04.9	113 21.1	12.2	50 32.1	12.4	222 12.0	56.0	124 31.2	11.1	89 18.1	107	24 39.5	−14
23	356 07.3	128 21.9	12.8	65 33.0	12.1	237 14.1	55.9	139 33.4	11.2	103 47.8	107	24 40.9	−12
3 0	11 09.8	143 22.7	−23 13.5	80 33.9	−25 11.8	252 16.2	+20 55.9	154 35.6	−12 11.3	118 17.5	107	−24 42.1	−10
1	26 12.3	158 23.5	14.1	95 34.8	11.5	267 18.3	55.8	169 37.8	11.4	132 47.2	106	24 43.1	−10
2	41 14.7	173 24.4	14.8	110 35.6	11.2	282 20.5	55.8	184 40.0	11.5	147 16.8	106	24 44.1	−9
3	56 17.2	188 25.2	·· 15.4	125 36.5	·· 11.0	297 22.6	·· 55.7	199 42.2	·· 11.6	161 46.4	106	·24 45.0	−7
4	71 19.7	203 26.0	16.1	140 37.4	10.7	312 24.7	55.6	214 44.4	11.7	176 16.0	106	24 45.7	−6
5	86 22.1	218 26.8	16.7	155 38.3	10.4	327 26.8	55.6	229 46.6	11.8	190 45.6	105	24 46.3	−5
6	101 24.6	233 27.6	−23 17.4	170 39.2	−25 10.1	342 29.0	+20 55.5	244 48.8	−12 11.9	205 15.1	105	−24 46.8	−3
7	116 27.1	248 28.5	18.0	185 40.0	09.8	357 31.1	55.5	259 51.0	12.0	219 44.6	105	24 47.1	−3
8	131 29.5	263 29.3	18.7	200 40.9	09.5	12 33.2	55.4	274 53.2	12.0	234 14.1	105	24 47.4	−1
9	146 32.0	278 30.1	·· 19.3	215 41.8	·· 09.2	27 35.3	·· 55.4	289 55.4	·· 12.1	248 43.6	104	·24 47.5	0
10	161 34.4	293 30.9	19.9	230 42.7	08.9	42 37.5	55.3	304 57.6	12.2	263 13.0	105	24 47.5	+1
11	176 36.9	308 31.8	20.6	245 43.5	08.7	57 39.6	55.2	319 59.8	12.3	277 42.5	104	24 47.4	+2
12	191 39.4	323 32.6	−23 21.2	260 44.4	−25 08.4	72 41.7	+20 55.2	335 02.0	−12 12.4	292 11.9	104	−24 47.2	+4
13	206 41.8	338 33.4	21.9	275 45.3	08.1	87 43.8	55.1	350 04.2	12.5	306 41.3	104	24 46.8	+5
14	221 44.3	353 34.3	22.5	290 46.2	07.8	102 46.0	55.1	5 06.4	12.6	321 10.7	104	24 46.3	+6
15	236 46.8	8 35.1	·· 23.1	305 47.0	·· 07.5	117 48.1	·· 55.0	20 08.6	·· 12.7	335 40.1	103	·24 45.7	+7
16	251 49.2	23 35.9	23.8	320 47.9	07.2	132 50.2	55.0	35 10.8	12.8	350 09.4	104	24 45.0	+9
17	266 51.7	38 36.8	24.4	335 48.8	06.9	147 52.3	54.9	50 13.0	12.9	4 38.8	103	24 44.1	+9
18	281 54.2	53 37.6	−23 25.0	350 49.7	−25 06.6	162 54.5	+20 54.9	65 15.2	−12 13.0	19 08.1	103	−24 43.2	+11
19	296 56.6	68 38.5	25.7	5 50.5	06.3	177 56.6	54.8	80 17.4	13.1	33 37.4	103	24 42.1	+12
20	311 59.1	83 39.3	26.3	20 51.4	06.1	192 58.7	54.7	95 19.6	13.2	48 06.7	103	24 40.9	+14
21	327 01.6	98 40.2	·· 26.9	35 52.3	·· 05.8	208 00.8	·· 54.7	110 21.8	·· 13.2	62 36.0	103	·24 39.5	+14
22	342 04.0	113 41.0	27.5	50 53.2	05.5	223 03.0	54.6	125 24.0	13.3	77 05.3	103	24 38.1	+16
23	357 06.5	128 41.9	28.2	65 54.0	05.2	238 05.1	54.6	140 26.2	13.4	91 34.6	103	24 36.5	+17
24	12 08.9	143 42.7	−23 28.8	80 54.9	−25 04.9	253 07.2	+20 54.5	155 28.4	−12 13.5	106 03.9	102	−24 34.8	+18
code	—	+ 8	− 7	+ 9	+ 3	+ 21	− 1	+ 22	− 1				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
1 0	182 30.4	− 2 53.5
1	197 30.6	54.4
2	212 30.8	55.4
3	227 31.1	.. 56.4
4	242 31.3	57.3
5	257 31.5	58.3
6	272 31.7	− 2 59.3
7	287 31.9	3 00.3
8	302 32.1	01.2
9	317 32.3	.. 02.2
10	332 32.5	03.2
11	347 32.7	04.1
12	2 32.9	− 3 05.1
13	17 33.1	06.1
14	32 33.3	07.1
15	47 33.5	.. 08.0
16	62 33.7	09.0
17	77 33.9	10.0
18	92 34.1	− 3 10.9
19	107 34.3	11.9
20	122 34.5	12.9
21	137 34.7	.. 13.9
22	152 34.9	14.8
23	167 35.1	15.8
2 0	182 35.3	− 3 16.8
1	197 35.5	17.7
2	212 35.7	18.7
3	227 35.9	.. 19.7
4	242 36.1	20.6
5	257 36.3	21.6
6	272 36.5	− 3 22.6
7	287 36.7	23.6
8	302 36.9	24.5
9	317 37.1	.. 25.5
10	332 37.3	26.5
11	347 37.5	27.4
12	2 37.7	− 3 28.4
13	17 37.9	29.4
14	32 38.1	30.3
15	47 38.3	.. 31.3
16	62 38.5	32.3
17	77 38.7	33.2
18	92 38.9	− 3 34.2
19	107 39.0	35.2
20	122 39.2	36.2
21	137 39.4	.. 37.1
22	152 39.6	38.1
23	167 39.8	39.1
3 0	182 40.0	− 3 40.0
1	197 40.2	41.0
2	212 40.4	42.0
3	227 40.6	.. 42.9
4	242 40.8	43.9
5	257 41.0	44.9
6	272 41.2	− 3 45.8
7	287 41.4	46.8
8	302 41.6	47.8
9	317 41.8	.. 48.7
10	332 42.0	49.7
11	347 42.2	50.7
12	2 42.4	− 3 51.6
13	17 42.6	52.6
14	32 42.8	53.6
15	47 43.0	.. 54.5
16	62 43.2	55.5
17	77 43.4	56.5
18	92 43.6	− 3 57.4
19	107 43.7	58.4
20	122 43.9	3 59.4
21	137 44.1	. 4 00.3
22	152 44.3	01.3
23	167 44.5	02.3
24	182 44.7	− 4 03.2
code	—	− 10

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.3	−40 28.8
5	Achernar	335 58.7	−57 27.7
30	Acrux	173 59.4	−62 51.0
19	Adhara	255 47.1	−28 54.3
10	Aldebaran	291 39.7	+16 25.3
32	Alioth	166 59.6	+56 12.3
34	Alkaid	153 33.9	+49 32.4
55	Al Na'ir	28 38.4	−47 10.8
15	Alnilam	276 30.9	− 1 13.6
25	Alphard	218 39.5	− 8 27.6
41	Alphecca	126 48.5	+26 52.1
1	Alpheratz	358 28.8	+28 50.7
51	Altair	62 51.1	+ 8 45.0
2	Ankaa	353 58.5	−42 32.9
42	Antares	113 20.5	−26 20.1
37	Arcturus	146 36.1	+19 25.1
43	Atria	109 02.1	−68 57.1
22	Avior	234 36.4	−59 21.5
13	Bellatrix	279 19.1	+ 6 18.8
16	Betelg'se	271 48.9	+ 7 24.2
17	Canopus	264 15.7	−52 39.9
12	Capella	281 39.4	+45 57.2
53	Deneb	50 01.3	+45 07.4
28	Denebola	183 18.8	+14 49.5
4	Diphda	349 39.6	−18 13.8
27	Dubhe	194 46.0	+61 59.6
14	Elnath	279 08.1	+28 34.3
47	Eltanin	91 06.7	+51 29.9
54	Enif	34 30.1	+ 9 40.2
56	Fomalhaut	16 12.1	−29 51.6
31	Gacrux	172 50.7	−56 51.6
29	Gienah	176 38.0	−17 17.4
35	Hadar	149 51.1	−60 09.5
6	Hamal	328 50.2	+23 15.2
48	Kaus Aust.	84 42.2	−34 24.6
40	Kochab	137 18.7	+74 20.5
57	Markab	14 21.9	+14 57.9
8	Menkar	315 00.8	+ 3 55.0
36	Menkent	148 59.9	−36 09.0
24	Miapl'dus	221 49.9	−69 31.6
9	Mirfak	309 43.1	+49 42.1
50	Nunki	76 52.8	−26 21.3
52	Peacock	54 28.1	−56 53.1
21	Pollux	244 21.6	+28 08.2
20	Procyon	245 45.8	+ 5 20.6
46	R'alhague	96 47.4	+12 35.6
26	Regulus	208 30.5	+12 11.4
11	Rigel	281 54.2	− 8 14.9
38	Rigil Kent.	140 52.6	−60 39.2
44	Sabik	103 03.1	−15 40.2
3	Schedar	350 30.3	+56 17.6
45	Shaula	97 21.8	−37 04.5
18	Sirius	259 12.5	−16 38.9
33	Spica	159 18.0	−10 55.5
23	Suhail	223 25.2	−43 14.7
49	Vega	81 08.8	+38 44.7
39	Zub'g'bi	137 54.5	−15 51.3

Lat.	Sunrise	Twlt. begins	Moonrise 1	Moonrise 2	Moonrise 3	Moonrise 4
N °	h m	h m	h m	h m	h m	h m
72	6 21	2 05	■	■	■	■
70	6 18	2 34	■	■	■	■
68	6 15	2 55	■	■	■	■
66	6 12	3 11	13 50	■	■	17 07
64	6 10	3 24	12 59	14 25	15 25	15 51
62	6 08	3 35	12 27	13 42	14 39	15 15
60	6 07	3 43	12 04	13 13	14 09	14 48
58	6 05	3 51	11 45	12 52	13 47	14 28
56	6 04	3 57	11 29	12 34	13 28	14 11
54	6 03	4 02	11 16	12 18	13 12	13 56
52	6 02	4 07	11 04	12 05	12 59	13 44
50	6 01	4 11	10 54	11 54	12 47	13 33
45	5 59	4 19	10 32	11 30	12 23	13 09
40	5 57	4 26	10 15	11 11	12 03	12 51
35	5 55	4 30	10 00	10 55	11 47	12 35
30	5 54	4 34	9 47	10 41	11 33	12 21
20	5 51	4 38	9 26	10 18	11 09	11 58
10	5 49	4 39	9 07	9 57	10 48	11 38
0	5 46	4 38	8 50	9 38	10 29	11 19
10	5 44	4 34	8 32	9 20	10 09	11 01
20	5 41	4 28	8 14	9 00	9 48	10 41
30	5 38	4 18	7 53	8 36	9 25	10 17
35	5 36	4 11	7 41	8 23	9 11	10 04
40	5 34	4 03	7 26	8 07	8 54	9 48
45	5 31	3 52	7 10	7 49	8 35	9 29
50	5 28	3 37	6 49	7 25	8 11	9 06
52	5 27	3 30	6 39	7 14	7 59	8 54
54	5 25	3 22	6 28	7 02	7 46	8 42
56	5 23	3 13	6 16	6 47	7 30	8 27
58	5 21	3 01	6 01	6 30	7 12	8 09
60	5 19	2 48	5 44	6 10	6 50	7 48
S						

Lat.	Sunset	Twlt. ends	Moonset 1	Moonset 2	Moonset 3	Moonset 4
N °	h m	h m	h m	h m	h m	h m
72	17 16	21 24	■	■	■	■
70	17 20	20 57	■	■	■	■
68	17 23	20 38	■	■	■	■
66	17 25	20 22	16 06	■	■	18 02
64	17 27	20 10	16 57	17 13	17 58	19 18
62	17 29	20 00	17 29	17 56	18 43	19 54
60	17 31	19 52	17 53	18 25	19 13	20 20
58	17 33	19 45	18 12	18 47	19 36	20 40
56	17 34	19 39	18 28	19 05	19 55	20 57
54	17 35	19 33	18 42	19 20	20 10	21 11
52	17 36	19 29	18 54	19 34	20 24	21 24
50	17 37	19 25	19 05	19 45	20 35	21 35
45	17 40	19 18	19 27	20 09	21 00	21 57
40	17 42	19 12	19 45	20 29	21 19	22 16
35	17 43	19 07	20 00	20 45	21 35	22 31
30	17 45	19 04	20 13	20 59	21 49	22 44
20	17 48	19 01	20 35	21 23	22 13	23 06
10	17 50	19 00	20 55	21 43	22 34	23 26
0	17 53	19 02	21 13	22 02	22 53	23 44
10	17 55	19 05	21 31	22 22	23 12	24 02
20	17 58	19 12	21 51	22 42	23 33	24 21
30	18 02	19 23	22 13	23 06	23 56	24 43
35	18 04	19 30	22 27	23 20	24 10	0 10
40	18 06	19 38	22 42	23 36	24 26	0 26
45	18 09	19 50	23 00	23 56	24 45	0 45
50	18 12	20 05	23 23	24 20	0 20	1 09
52	18 13	20 12	23 34	24 31	0 31	1 21
54	18 15	20 21	23 46	24 45	0 45	1 34
56	18 17	20 31	24 00	0 00	1 00	1 49
58	18 19	20 43	24 17	0 17	1 18	2 07
60	18 21	20 57	24 37	0 37	1 41	2 28
S						

Equation of Time (App.—Mean)

GMT	1	2	3
h	m s	m s	m s
0	+10 01.4	+10 20.7	+10 39.7
6	+10 06.2	+10 25.5	+10 44.4
12	+10 11.1	+10 30.3	+10 49.1
18	+10 15.9	+10 35.0	+10 53.8
24	+10 20.7	+10 39.7	+10 58.5

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
1	15 01	14 28	18 40	7 17	13 47
2	15 50	14 27	18 38	7 13	13 43
3	16 41	14 26	18 37	7 10	13 40
4	17 32	14 24	18 35	7 07	13 36

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.3	0.3	0.2
30			
	0.3	0.2	0.1
45			
	0.3	0.2	0.1
60			
	0.3	0.1	0.1
75			
	0.3	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	1	2	3
°	′	′	′
0			
	11.9	12.1	12.5
4			
	11.9	12.1	12.5
8			
	11.9	12.2	12.5
12			
	11.9	12.2	12.6
16			
	12.0	12.2	12.6
20			
	12.1	12.3	12.7
24			
	12.2	12.4	12.7
28			
	12.2	12.5	12.8
32			
	12.4	12.6	12.9
36			
	12.5	12.7	13.0
40			
	12.6	12.8	13.1
44			
	12.7	12.9	13.2
48			
	12.9	13.1	13.4
52			
	13.1	13.2	13.5
56			
	13.2	13.4	13.6
60			
	13.4	13.5	13.8
64			
	13.6	13.7	13.9
68			
	13.8	13.9	14.1
72			
	14.0	14.1	14.2
76			
	14.2	14.3	14.4
80			
	14.4	14.4	14.6
84			
	14.6	14.6	14.7
88			
	14.7	14.8	14.9
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	1	2	3
°	′	′	′
0			
	17.7	17.5	17.3
4			
	17.6	17.5	17.3
8			
	17.6	17.5	17.3
12			
	17.6	17.4	17.2
16			
	17.5	17.4	17.2
20			
	17.5	17.3	17.1
24			
	17.4	17.2	17.1
28			
	17.3	17.2	17.0
32			
	17.2	17.1	16.9
36			
	17.0	16.9	16.8
40			
	16.9	16.8	16.7
44			
	16.8	16.7	16.6
48			
	16.6	16.6	16.4
52			
	16.5	16.4	16.3
56			
	16.3	16.2	16.2
60			
	16.1	16.1	16.0
64			
	15.9	15.9	15.9
68			
	15.8	15.7	15.7
72			
	15.6	15.6	15.6
76			
	15.4	15.4	15.4
80			
	15.2	15.2	15.2
84			
	15.0	15.0	15.1
88			
	14.8	14.9	14.9
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −4.3 GHA	VENUS Dec.	MARS −0.4 GHA	MARS Dec.	JUPITER −1.7 GHA	JUPITER Dec.	SATURN 0.8 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
4 0	12 08.9	143 42.7	−23 28.8	80 54.9	−25 04.9	253 07.2	+20 54.5	155 28.4	−12 13.5	106 03.9	102	−24 34.8	+18
1	27 11.4	158 43.6	29.4	95 55.8	04.6	268 09.4	54.5	170 30.6	13.6	120 33.1	103	24 33.0	+20
2	42 13.9	173 44.4	30.1	110 56.7	04.3	283 11.5	54.4	185 32.8	13.7	135 02.4	102	24 31.0	+20
3	57 16.3	188 45.3	•• 30.7	125 57.5	•• 04.0	298 13.6	•• 54.3	200 35.0	•• 13.8	149 31.6	102	·24 29.0	+22
4	72 18.8	203 46.2	31.3	140 58.4	03.7	313 15.7	54.3	215 37.2	13.9	164 00.8	103	24 26.8	+24
5	87 21.3	218 47.0	31.9	155 59.3	03.4	328 17.9	54.2	230 39.4	14.0	178 30.1	102	24 24.4	+24
6	102 23.7	233 47.9	−23 32.5	171 00.1	−25 03.1	343 20.0	+20 54.2	245 41.6	−12 14.1	192 59.3	102	−24 22.0	+26
7	117 26.2	248 48.8	33.2	186 01.0	02.8	358 22.1	54.1	260 43.8	14.2	207 28.5	102	24 19.4	+26
8	132 28.7	263 49.6	33.8	201 01.9	02.5	13 24.3	54.1	275 46.0	14.3	221 57.7	102	24 16.8	+29
9	147 31.1	278 50.5	•• 34.4	216 02.8	•• 02.3	28 26.4	•• 54.0	290 48.2	•• 14.4	236 26.9	102	·24 13.9	+29
10	162 33.6	293 51.4	35.0	231 03.6	02.0	43 28.5	54.0	305 50.4	14.5	250 56.1	102	24 11.0	+30
11	177 36.1	308 52.2	35.6	246 04.5	01.7	58 30.7	53.9	320 52.6	14.5	265 25.3	102	24 08.0	+32
12	192 38.5	323 53.1	−23 36.3	261 05.4	−25 01.4	73 32.8	+20 53.8	335 54.8	−12 14.6	279 54.5	102	−24 04.8	+33
13	207 41.0	338 54.0	36.9	276 06.2	01.1	88 34.9	53.8	350 56.9	14.7	294 23.7	102	24 01.5	+34
14	222 43.4	353 54.9	37.5	291 07.1	00.8	103 37.1	53.7	5 59.1	14.8	308 52.9	102	23 58.1	+36
15	237 45.9	8 55.8	•• 38.1	306 08.0	•• 00.5	118 39.2	•• 53.7	21 01.3	•• 14.9	323 22.1	103	·23 54.5	+36
16	252 48.4	23 56.6	38.7	321 08.8	25 00.2	133 41.3	53.6	36 03.5	15.0	337 51.4	102	23 50.9	+38
17	267 50.8	38 57.5	39.3	336 09.7	24 59.9	148 43.4	53.6	51 05.7	15.1	352 20.6	102	23 47.1	+39
18	282 53.3	53 58.4	−23 39.9	351 10.6	−24 59.6	163 45.6	+20 53.5	66 07.9	−12 15.2	6 49.8	102	−23 43.2	+41
19	297 55.8	68 59.3	40.5	6 11.4	59.3	178 47.7	53.5	81 10.1	15.3	21 19.0	102	23 39.1	+41
20	312 58.2	84 00.2	41.1	21 12.3	59.0	193 49.8	53.4	96 12.3	15.4	35 48.2	102	23 35.0	+43
21	328 00.7	99 01.1	•• 41.7	36 13.2	•• 58.7	208 52.0	•• 53.3	111 14.5	•• 15.5	50 17.4	102	·23 30.7	+44
22	343 03.2	114 02.0	42.4	51 14.0	58.4	223 54.1	53.3	126 16.7	15.6	64 46.6	103	23 26.3	+45
23	358 05.6	129 02.9	43.0	66 14.9	58.1	238 56.2	53.2	141 18.9	15.7	79 15.9	102	23 21.8	+47
5 0	13 08.1	144 03.8	−23 43.6	81 15.8	−24 57.8	253 58.4	+20 53.2	156 21.1	−12 15.8	93 45.1	102	−23 17.1	+47
1	28 10.6	159 04.7	44.2	96 16.6	57.5	269 00.5	53.1	171 23.3	15.9	108 14.3	103	23 12.4	+49
2	43 13.0	174 05.6	44.8	111 17.5	57.2	284 02.7	53.1	186 25.5	15.9	122 43.6	102	23 07.5	+50
3	58 15.5	189 06.5	•• 45.4	126 18.4	•• 56.9	299 04.8	•• 53.0	201 27.7	•• 16.0	137 12.8	103	·23 02.5	+52
4	73 17.9	204 07.4	46.0	141 19.2	56.6	314 06.9	53.0	216 29.9	16.1	151 42.1	103	22 57.3	+52
5	88 20.4	219 08.3	46.6	156 20.1	56.3	329 09.1	52.9	231 32.1	16.2	166 11.4	102	22 52.1	+54
6	103 22.9	234 09.2	−23 47.2	171 20.9	−24 56.0	344 11.2	+20 52.8	246 34.3	−12 16.3	180 40.6	103	−22 46.7	+55
7	118 25.3	249 10.1	47.8	186 21.8	55.7	359 13.3	52.8	261 36.5	16.4	195 09.9	103	22 41.2	+56
8	133 27.8	264 11.1	48.4	201 22.7	55.4	14 15.5	52.7	276 38.7	16.5	209 39.2	103	22 35.6	+57
9	148 30.3	279 12.0	•• 49.0	216 23.5	•• 55.1	29 17.6	•• 52.7	291 40.9	•• 16.6	224 08.5	104	·22 29.9	+58
10	163 32.7	294 12.9	49.6	231 24.4	54.8	44 19.7	52.6	306 43.1	16.7	238 37.9	103	22 24.1	+60
11	178 35.2	309 13.8	50.1	246 25.2	54.5	59 21.9	52.6	321 45.3	16.8	253 07.2	103	22 18.1	+61
12	193 37.7	324 14.7	−23 50.7	261 26.1	−24 54.2	74 24.0	+20 52.5	336 47.5	−12 16.9	267 36.5	104	−22 12.0	+62
13	208 40.1	339 15.7	51.3	276 27.0	53.9	89 26.2	52.5	351 49.7	17.0	282 05.9	103	22 05.8	+63
14	223 42.6	354 16.6	51.9	291 27.8	53.6	104 28.3	52.4	6 51.8	17.1	296 35.2	104	21 59.5	+65
15	238 45.1	9 17.5	•• 52.5	306 28.7	•• 53.3	119 30.4	•• 52.4	21 54.0	•• 17.2	311 04.6	104	·21 53.0	+65
16	253 47.5	24 18.4	53.1	321 29.6	53.0	134 32.6	52.3	36 56.2	17.2	325 34.0	104	21 46.5	+67
17	268 50.0	39 19.4	53.7	336 30.4	52.7	149 34.7	52.2	51 58.4	17.3	340 03.4	104	21 39.8	+68
18	283 52.4	54 20.3	−23 54.3	351 31.3	−24 52.4	164 36.8	+20 52.2	67 00.6	−12 17.4	354 32.8	104	−21 33.0	+69
19	298 54.9	69 21.3	54.9	6 32.1	52.1	179 39.0	52.1	82 02.8	17.5	9 02.2	105	21 26.1	+70
20	313 57.4	84 22.2	55.4	21 33.0	51.8	194 41.1	52.1	97 05.0	17.6	23 31.7	104	21 19.1	+71
21	328 59.8	99 23.1	•• 56.0	36 33.8	•• 51.5	209 43.3	•• 52.0	112 07.2	•• 17.7	38 01.1	105	·21 12.0	+73
22	344 02.3	114 24.1	56.6	51 34.7	51.1	224 45.4	52.0	127 09.4	17.8	52 30.6	105	21 04.7	+74
23	359 04.8	129 25.0	57.2	66 35.6	50.8	239 47.5	51.9	142 11.6	17.9	67 00.1	105	20 57.3	+75
6 0	14 07.2	144 26.0	−23 57.8	81 36.4	−24 50.5	254 49.7	+20 51.9	157 13.8	−12 18.0	81 29.6	105	−20 49.8	+76
1	29 09.7	159 26.9	58.3	96 37.3	50.2	269 51.8	51.8	172 16.0	18.1	95 59.1	105	20 42.2	+77
2	44 12.2	174 27.9	58.9	111 38.1	49.9	284 54.0	51.8	187 18.2	18.2	110 28.6	105	20 34.5	+78
3	59 14.6	189 28.8	·23 59.5	126 39.0	•• 49.6	299 56.1	•• 51.7	202 20.4	•• 18.3	124 58.1	106	·20 26.7	+79
4	74 17.1	204 29.8	24 00.1	141 39.8	49.3	314 58.2	51.6	217 22.6	18.4	139 27.7	106	20 18.8	+81
5	89 19.5	219 30.7	00.7	156 40.7	49.0	330 00.4	51.6	232 24.8	18.5	153 57.3	106	20 10.7	+81
6	104 22.0	234 31.7	−24 01.2	171 41.6	−24 48.7	345 02.5	+20 51.5	247 27.0	−12 18.6	168 26.9	106	−20 02.6	+83
7	119 24.5	249 32.7	01.8	186 42.4	48.4	0 04.7	51.5	262 29.2	18.6	182 56.5	106	19 54.3	+84
8	134 26.9	264 33.6	02.4	201 43.3	48.1	15 06.8	51.4	277 31.4	18.7	197 26.1	106	19 45.9	+85
9	149 29.4	279 34.6	•• 03.0	216 44.1	•• 47.8	30 09.0	•• 51.4	292 33.5	•• 18.8	211 55.7	106	·19 37.4	+86
10	164 31.9	294 35.6	03.5	231 45.0	47.5	45 11.1	51.3	307 35.7	18.9	226 25.3	107	19 28.8	+87
11	179 34.3	309 36.5	04.1	246 45.8	47.1	60 13.2	51.3	322 37.9	19.0	240 55.0	107	19 20.1	+88
12	194 36.8	324 37.5	−24 04.7	261 46.7	−24 46.8	75 15.4	+20 51.2	337 40.1	−12 19.1	255 24.7	107	−19 11.3	+90
13	209 39.3	339 38.5	05.2	276 47.5	46.5	90 17.5	51.2	352 42.3	19.2	269 54.4	107	19 02.3	+[illegible]
14	224 41.7	354 39.4	05.8	291 48.4	46.2	105 19.7	51.1	7 44.5	19.3	284 24.1	107	18 53.3	+[illegible]
15	239 44.2	9 40.4	•• 06.4	306 49.2	•• 45.9	120 21.8	•• 51.1	22 46.7	•• 19.4	298 53.8	108	·18 44.1	+92
16	254 46.7	24 41.4	06.9	321 50.1	45.6	135 24.0	51.0	37 48.9	19.5	313 23.6	107	18 34.9	+94
17	269 49.1	39 42.4	07.5	336 50.9	45.3	150 26.1	50.9	52 51.1	19.6	327 53.3	108	18 25.5	+94
18	284 51.6	54 43.4	−24 08.0	351 51.8	−24 45.0	165 28.3	+20 50.9	67 53.3	−12 19.7	342 23.1	108	−18 16.1	+96
19	299 54.0	69 44.4	08.6	6 52.6	44.7	180 30.4	50.8	82 55.5	19.8	356 52.9	108	18 06.5	+97
20	314 56.5	84 45.3	09.2	21 53.5	44.3	195 32.5	50.8	97 57.7	19.9	11 22.7	108	17 56.8	+98
21	329 59.0	99 46.3	•• 09.7	36 54.3	•• 44.0	210 34.7	•• 50.7	112 59.9	•• 20.0	25 52.5	108	·17 47.0	+99
22	345 01.4	114 47.3	10.3	51 55.2	43.7	225 36.8	50.7	128 02.1	20.0	40 22.3	109	17 37.1	+100
23	0 03.9	129 48.3	10.8	66 56.0	43.4	240 39.0	50.6	143 04.3	20.1	54 52.2	109	17 27.1	+100
24	15 06.4	144 49.3	−24 11.4	81 56.9	−24 43.1	255 41.1	+20 50.6	158 06.4	−12 20.2	69 22.1	108	−17 17.1	+102
code	—	+ 10	− 6	+ 9	+ 3	+ 22	0	+ 22	− 1				

GMT		SUN GHA	SUN Dec.
h		° ′	° ′
4	0	182 44.7	− 4 03.2
	1	197 44.9	04.2
	2	212 45.1	05.2
	3	227 45.3 ••	06.1
	4	242 45.5	07.1
	5	257 45.7	08.1
	6	272 45.9	− 4 09.0
	7	287 46.1	10.0
	8	302 46.3	11.0
	9	317 46.4 ••	11.9
	10	332 46.6	12.9
	11	347 46.8	13.9
	12	2 47.0	− 4 14.8
	13	17 47.2	15.8
	14	32 47.4	16.8
	15	47 47.6 ••	17.7
	16	62 47.8	18.7
	17	77 48.0	19.7
	18	92 48.2	− 4 20.6
	19	107 48.4	21.6
	20	122 48.6	22.6
	21	137 48.7 ••	23.5
	22	152 48.9	24.5
	23	167 49.1	25.5
5	0	182 49.3	− 4 26.4
	1	197 49.5	27.4
	2	212 49.7	28.3
	3	227 49.9 ••	29.3
	4	242 50.1	30.3
	5	257 50.3	31.2
	6	272 50.5	− 4 32.2
	7	287 50.6	33.2
	8	302 50.8	34.1
	9	317 51.0 ••	35.1
	10	332 51.2	36.1
	11	347 51.4	37.0
	12	2 51.6	− 4 38.0
	13	17 51.8	38.9
	14	32 52.0	39.9
	15	47 52.1 ••	40.9
	16	62 52.3	41.8
	17	77 52.5	42.8
	18	92 52.7	− 4 43.8
	19	107 52.9	44.7
	20	122 53.1	45.7
	21	137 53.3 ••	46.6
	22	152 53.5	47.6
	23	167 53.6	48.6
6	0	182 53.8	− 4 49.5
	1	197 54.0	50.5
	2	212 54.2	51.5
	3	227 54.4 ••	52.4
	4	242 54.6	53.4
	5	257 54.8	54.3
	6	272 54.9	− 4 55.3
	7	287 55.1	56.3
	8	302 55.3	57.2
	9	317 55.5 ••	58.2
	10	332 55.7	4 59.1
	11	347 55.9	5 00.1
	12	2 56.1	− 5 01.1
	13	17 56.2	02.0
	14	32 56.4	03.0
	15	47 56.6 ••	03.9
	16	62 56.8	04.9
	17	77 57.0	05.9
	18	92 57.2	− 5 06.8
	19	107 57.3	07.8
	20	122 57.5	08.7
	21	137 57.7 ••	09.7
	22	152 57.9	10.7
	23	167 58.1	11.6
	24	182 58.3	− 5 12.6
code		—	− 9

No.	Name	STARS SHA	STARS Dec.
		° ′	° ′
7	Acamar	315 51.3	−40 28.8
5	Achernar	335 58.7	−57 27.7
30	Acrux	173 59.4	−62 50.9
19	Adhara	255 47.1	−28 54.3
10	Aldebaran	291 39.7	+16 25.3
32	Alioth	166 59.6	+56 12.3
34	Alkaid	153 33.9	+49 32.3
55	Al Na'ir	28 38.5	−47 10.8
15	Alnilam	276 30.9	− 1 13.6
25	Alphard	218 39.5	− 8 27.6
41	Alphecca	126 48.5	+26 52.1
1	Alpheratz	358 28.8	+28 50.7
51	Altair	62 51.1	+ 8 45.0
2	Ankaa	353 58.5	−42 32.9
42	Antares	113 20.5	−26 20.1
37	Arcturus	146 36.1	+19 25.1
43	Atria	109 02.2	−68 57.1
22	Avior	234 36.4	−59 21.5
13	Bellatrix	279 19.1	+ 6 18.8
16	Betelg'se	271 48.8	+ 7 24.2
17	Canopus	264 15.6	−52 39.9
12	Capella	281 39.3	+45 57.2
53	Deneb	50 01.3	+45 07.4
28	Denebola	183 18.8	+14 49.5
4	Diphda	349 39.6	−18 13.8
27	Dubhe	194 46.0	+61 59.6
14	Elnath	279 08.1	+28 34.3
47	Eltanin	91 06.7	+51 29.9
54	Enif	34 30.1	+ 9 40.2
56	Fomalhaut	16 12.1	−29 51.6
31	Gacrux	172 50.7	−56 51.6
29	Gienah	176 38.0	−17 17.4
35	Hadar	149 51.1	−60 09.5
6	Hamal	328 50.2	+23 15.2
48	Kaus Aust.	84 42.2	−34 24.6
40	Kochab	137 18.7	+74 20.5
57	Markab	14 21.9	+14 58.0
8	Menkar	315 00.8	+ 3 55.0
36	Menkent	148 59.9	−36 09.0
24	Miapl'dus	221 49.8	−69 31.6
9	Mirfak	309 43.1	+49 42.2
50	Nunki	76 52.8	−26 21.3
52	Peacock	54 28.2	−56 53.1
21	Pollux	244 21.5	+28 08.2
20	Procyon	245 45.8	+ 5 20.6
46	R'alhague	96 47.4	+12 35.6
26	Regulus	208 30.5	+12 11.4
11	Rigel	281 54.2	− 8 14.9
38	Rigil Kent.	140 52.7	−60 39.2
44	Sabik	103 03.2	−15 40.2
3	Schedar	350 30.3	+56 17.6
45	Shaula	97 21.8	−37 04.5
18	Sirius	259 12.5	−16 38.9
33	Spica	159 18.0	−10 55.5
23	Suhail	223 25.1	−43 14.7
49	Vega	81 08.8	+38 44.7
39	Zub'g'bi	137 54.5	−15 51.3

Lat.	Sunrise	Twlt. begins	Moonrise 4	Moonrise 5	Moonrise 6	Moonrise 7
N °	h m	h m	h m	h m	h m	h m
72	6 35	2 27	■	■	■	17 23
70	6 29	2 51	■	■	17 36	16 55
68	6 25	3 09	■	17 41	16 53	16 34
66	6 22	3 23	17 07	16 35	16 24	16 17
64	6 19	3 35	15 51	15 59	16 02	16 03
62	6 16	3 43	15 15	15 34	15 45	15 51
60	6 14	3 51	14 48	15 14	15 30	15 41
58	6 12	3 57	14 28	14 57	15 17	15 32
56	6 10	4 04	14 11	14 43	15 06	15 25
54	6 08	4 08	13 56	14 30	14 57	15 18
52	6 07	4 12	13 44	14 19	14 48	15 11
50	6 05	4 16	13 33	14 10	14 40	15 06
45	6 02	4 23	13 09	13 49	14 24	14 53
40	6 00	4 29	12 51	13 33	14 10	14 43
35	5 57	4 33	12 35	13 19	13 58	14 35
30	5 55	4 36	12 21	13 07	13 48	14 27
20	5 52	4 38	11 58	12 46	13 31	14 14
10	5 48	4 38	11 38	12 27	13 15	14 02
0	5 45	4 37	11 19	12 10	13 01	13 51
10	5 42	4 33	11 01	11 53	12 47	13 40
20	5 38	4 25	10 41	11 35	12 31	13 28
30	5 34	4 14	10 17	11 14	12 13	13 14
35	5 32	4 07	10 04	11 01	12 03	13 06
40	5 29	3 58	9 48	10 47	11 51	12 57
45	5 26	3 45	9 29	10 30	11 37	12 47
50	5 22	3 30	9 06	10 09	11 19	12 34
52	5 20	3 22	8 54	9 59	11 11	12 28
54	5 18	3 13	8 42	9 48	11 02	12 21
56	5 15	3 02	8 27	9 35	10 52	12 14
58	5 13	2 50	8 09	9 20	10 40	12 05
60	5 10	2 35	7 48	9 02	10 26	11 56
S						

Lat.	Sunset	Twlt. ends	Moonset 4	Moonset 5	Moonset 6	Moonset 7
N °	h m	h m	h m	h m	h m	h m
72	17 00	21 01	■	■	■	23 06
70	17 06	20 39	■	■	21 07	23 32
68	17 10	20 22	■	19 15	21 48	23 52
66	17 14	20 09	18 02	20 20	22 16	24 07
64	17 17	19 58	19 18	20 55	22 37	24 20
62	17 20	19 50	19 54	21 20	22 54	24 30
60	17 22	19 42	20 20	21 40	23 08	24 39
58	17 24	19 35	20 40	21 56	23 20	24 47
56	17 26	19 30	20 57	22 10	23 30	24 54
54	17 28	19 26	21 11	22 22	23 39	25 00
52	17 29	19 21	21 24	22 32	23 47	25 06
50	17 31	19 19	21 35	22 42	23 54	25 11
45	17 34	19 12	21 57	23 01	24 10	0 10
40	17 37	19 07	22 16	23 17	24 22	0 22
35	17 39	19 03	22 31	23 30	24 33	0 33
30	17 41	19 00	22 44	23 42	24 42	0 42
20	17 45	18 58	23 06	24 02	0 02	0 58
10	17 49	18 59	23 26	24 19	0 19	1 12
0	17 52	19 01	23 44	24 35	0 35	1 25
10	17 55	19 05	24 02	0 02	0 51	1 38
20	17 59	19 13	24 21	0 21	1 07	1 51
30	18 03	19 24	24 43	0 43	1 27	2 07
35	18 06	19 32	0 10	0 56	1 38	2 16
40	18 09	19 42	0 26	1 11	1 51	2 26
45	18 12	19 54	0 45	1 29	2 06	2 37
50	18 17	20 12	1 09	1 50	2 24	2 52
52	18 19	20 20	1 21	2 01	2 33	2 58
54	18 21	20 29	1 34	2 12	2 42	3 06
56	18 23	20 40	1 49	2 26	2 53	3 14
58	18 26	20 53	2 07	2 41	3 05	3 23
60	18 29	21 09	2 28	3 00	3 20	3 33
S						

GMT	Equation of Time (App.—Mean) 4	5	6
h	m s	m s	m s
0	+10 58.5	+11 16.9	+11 35.0
6	+11 03.1	+11 21.4	+11 39.4
12	+11 07.7	+11 26.0	+11 43.9
18	+11 12.3	+11 30.5	+11 48.3
24	+11 16.9	+11 35.0	+11 52.7

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
4	17 32	14 24	18 35	7 07	13 36
5	18 23	14 23	18 34	7 03	13 33
6	19 13	14 21	18 33	7 00	13 29
7	20 03	14 20	18 31	6 56	13 26

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.3	0.3	0.2
30			
	0.3	0.2	0.1
45			
	0.3	0.2	0.1
60			
	0.3	0.1	0.1
75			
	0.3	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	4	5	6
°	′	′	′
0			
	13.1	14.0	15.0
4			
	13.1	14.0	15.0
8			
	13.2	14.0	15.0
12			
	13.2	14.1	15.1
16			
	13.2	14.1	15.1
20			
	13.3	14.1	15.1
24			
	13.3	14.1	15.1
28			
	13.4	14.2	15.1
32			
	13.5	14.2	15.1
36			
	13.5	14.3	15.1
40			
	13.6	14.3	15.1
44			
	13.7	14.4	15.2
48			
	13.8	14.5	15.2
52			
	13.9	14.5	15.2
56			
	14.0	14.6	15.2
60			
	14.1	14.7	15.3
64			
	14.3	14.7	15.3
68			
	14.4	14.8	15.3
72			
	14.5	14.9	15.3
76			
	14.6	15.0	15.4
80			
	14.8	15.1	15.4
84			
	14.9	15.1	15.4
88			
	15.0	15.2	15.4
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	4	5	6
°	′	′	′
0			
	16.9	16.4	15.8
4			
	16.9	16.4	15.8
8			
	16.9	16.4	15.8
12			
	16.9	16.4	15.8
16			
	16.8	16.4	15.8
20			
	16.8	16.3	15.8
24			
	16.7	16.3	15.8
28			
	16.7	16.3	15.8
32			
	16.6	16.2	15.8
36			
	16.5	16.2	15.8
40			
	16.4	16.1	15.7
44			
	16.4	16.1	15.7
48			
	16.3	16.0	15.7
52			
	16.2	15.9	15.7
56			
	16.0	15.9	15.7
60			
	15.9	15.8	15.6
64			
	15.8	15.7	15.6
68			
	15.7	15.6	15.6
72			
	15.6	15.6	15.6
76			
	15.4	15.5	15.5
80			
	15.3	15.4	15.5
84			
	15.2	15.3	15.5
88			
	15.1	15.2	15.4
90			

Subtract from table, back cover

First Quarter 5

GMT	♈ GHA	VENUS −4.3 GHA	VENUS Dec.	MARS −0.3 GHA	MARS Dec.	JUPITER −1.7 GHA	JUPITER Dec.	SATURN 0.8 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
7 0	15 06.4	144 49.3	−24 11.4	81 56.9	−24 43.1	255 41.1	+20 50.6	158 06.4	−12 20.2	69 22.1	108	−17 17.1	+102
1	30 08.8	159 50.3	12.0	96 57.7	42.8	270 43.3	50.5	173 08.6	20.3	83 51.9	109	17 06.9	+103
2	45 11.3	174 51.3	12.5	111 58.6	42.5	285 45.4	50.5	188 10.8	20.4	98 21.8	109	16 56.6	+104
3	60 13.8	189 52.3	•• 13.1	126 59.4	•• 42.2	300 47.6	•• 50.4	203 13.0	•• 20.5	112 51.7	110	·16 46.2	+105
4	75 16.2	204 53.3	13.6	142 00.3	41.8	315 49.7	50.4	218 15.2	20.6	127 21.7	109	16 35.7	+106
5	90 18.7	219 54.3	14.2	157 01.1	41.5	330 51.9	50.3	233 17.4	20.7	141 51.6	109	16 25.1	+107
6	105 21.1	234 55.4	−24 14.7	172 02.0	−24 41.2	345 54.0	+20 50.3	248 19.6	−12 20.8	156 21.5	110	−16 14.4	+108
7	120 23.6	249 56.4	15.3	187 02.8	40.9	0 56.2	50.2	263 21.8	20.9	170 51.5	110	16 03.6	+109
8	135 26.1	264 57.4	15.8	202 03.7	40.6	15 58.3	50.1	278 24.0	21.0	185 21.5	110	15 52.7	+109
9	150 28.5	279 58.4	•• 16.4	217 04.5	•• 40.3	31 00.5	•• 50.1	293 26.2	•• 21.1	199 51.5	110	·15 41.8	+111
10	165 31.0	294 59.4	16.9	232 05.4	39.9	46 02.6	50.0	308 28.4	21.2	214 21.5	110	15 30.7	+112
11	180 33.5	310 00.4	17.5	247 06.2	39.6	61 04.8	50.0	323 30.6	21.3	228 51.5	110	15 19.5	+113
12	195 35.9	325 01.5	−24 18.0	262 07.1	−24 39.3	76 06.9	+20 49.9	338 32.8	−12 21.4	243 21.5	110	−15 08.2	+113
13	210 38.4	340 02.5	18.5	277 07.9	39.0	91 09.1	49.9	353 35.0	21.4	257 51.5	111	14 56.9	+115
14	225 40.9	355 03.5	19.1	292 08.8	38.7	106 11.2	49.8	8 37.1	21.5	272 21.6	110	14 45.4	+115
15	240 43.3	10 04.6	•• 19.6	307 09.6	•• 38.4	121 13.4	•• 49.8	23 39.3	•• 21.6	286 51.6	111	·14 33.9	+116
16	255 45.8	25 05.6	20.2	322 10.5	38.0	136 15.5	49.7	38 41.5	21.7	301 21.7	110	14 22.3	+118
17	270 48.3	40 06.6	20.7	337 11.3	37.7	151 17.7	49.7	53 43.7	21.8	315 51.7	111	14 10.5	+118
18	285 50.7	55 07.7	−24 21.2	352 12.1	−24 37.4	166 19.8	+20 49.6	68 45.9	−12 21.9	330 21.8	111	−13 58.7	+119
19	300 53.2	70 08.7	21.8	7 13.0	37.1	181 22.0	49.6	83 48.1	22.0	344 51.9	111	13 46.8	+120
20	315 55.6	85 09.7	22.3	22 13.8	36.8	196 24.1	49.5	98 50.3	22.1	359 22.0	111	13 34.8	+120
21	330 58.1	100 10.8	•• 22.9	37 14.7	•• 36.4	211 26.3	•• 49.5	113 52.5	•• 22.2	13 52.1	111	·13 22.8	+122
22	346 00.6	115 11.8	23.4	52 15.5	36.1	226 28.4	49.4	128 54.7	22.3	28 22.2	111	13 10.6	+123
23	1 03.0	130 12.9	23.9	67 16.4	35.8	241 30.6	49.4	143 56.9	22.4	42 52.3	112	12 58.3	+123
8 0	16 05.5	145 13.9	−24 24.5	82 17.2	−24 35.5	256 32.7	+20 49.3	158 59.1	−12 22.5	57 22.5	111	−12 46.0	+124
1	31 08.0	160 15.0	25.0	97 18.0	35.2	271 34.9	49.3	174 01.3	22.6	71 52.6	111	12 33.6	+125
2	46 10.4	175 16.0	25.5	112 18.9	34.8	286 37.0	49.2	189 03.4	22.7	86 22.7	112	12 21.1	+126
3	61 12.9	190 17.1	•• 26.0	127 19.7	•• 34.5	301 39.2	•• 49.1	204 05.6	•• 22.8	100 52.9	111	·12 08.5	+126
4	76 15.4	205 18.2	26.6	142 20.6	34.2	316 41.4	49.1	219 07.8	22.9	115 23.0	112	11 55.9	+128
5	91 17.8	220 19.2	27.1	157 21.4	33.9	331 43.5	49.0	234 10.0	22.9	129 53.2	111	11 43.1	+128
6	106 20.3	235 20.3	−24 27.6	172 22.3	−24 33.5	346 45.7	+20 49.0	249 12.2	−12 23.0	144 23.3	112	−11 30.3	+129
7	121 22.8	250 21.3	28.1	187 23.1	33.2	1 47.8	48.9	264 14.4	23.1	158 53.5	111	11 17.4	+130
8	136 25.2	265 22.4	28.7	202 23.9	32.9	16 50.0	48.9	279 16.6	23.2	173 23.6	112	11 04.4	+130
9	151 27.7	280 23.5	•• 29.2	217 24.8	•• 32.6	31 52.1	•• 48.8	294 18.8	•• 23.3	187 53.8	111	·10 51.4	+131
10	166 30.1	295 24.6	29.7	232 25.6	32.2	46 54.3	48.8	309 21.0	23.4	202 23.9	112	10 38.3	+132
11	181 32.6	310 25.6	30.2	247 26.5	31.9	61 56.4	48.7	324 23.2	23.5	216 54.1	111	10 25.1	+133
12	196 35.1	325 26.7	−24 30.8	262 27.3	−24 31.6	76 58.6	+20 48.7	339 25.4	−12 23.6	231 24.2	111	−10 11.8	+134
13	211 37.5	340 27.8	31.3	277 28.1	31.3	92 00.8	48.6	354 27.6	23.7	245 54.3	112	9 58.4	+134
14	226 40.0	355 28.9	31.8	292 29.0	30.9	107 02.9	48.6	9 29.7	23.8	260 24.5	111	9 45.0	+134
15	241 42.5	10 30.0	•• 32.3	307 29.8	•• 30.6	122 05.1	•• 48.5	24 31.9	•• 23.9	274 54.6	112	· 9 31.6	+136
16	256 44.9	25 31.1	32.8	322 30.7	30.3	137 07.2	48.5	39 34.1	24.0	289 24.8	111	9 18.0	+136
17	271 47.4	40 32.1	33.3	337 31.5	30.0	152 09.4	48.4	54 36.3	24.1	303 54.9	111	9 04.4	+137
18	286 49.9	55 33.2	−24 33.8	352 32.3	−24 29.6	167 11.5	+20 48.4	69 38.5	−12 24.2	318 25.0	111	− 8 50.7	+138
19	301 52.3	70 34.3	34.4	7 33.2	29.3	182 13.7	48.3	84 40.7	24.3	332 55.1	112	8 36.9	+138
20	316 54.8	85 35.4	34.9	22 34.0	29.0	197 15.9	48.3	99 42.9	24.4	347 25.3	111	8 23.1	+139
21	331 57.2	100 36.5	•• 35.4	37 34.8	•• 28.7	212 18.0	•• 48.2	114 45.1	•• 24.4	1 55.4	111	· 8 09.2	+139
22	346 59.7	115 37.6	35.9	52 35.7	28.3	227 20.2	48.2	129 47.3	24.5	16 25.5	110	7 55.3	+140
23	2 02.2	130 38.7	36.4	67 36.5	28.0	242 22.3	48.1	144 49.5	24.6	30 55.5	111	7 41.3	+141
9 0	17 04.6	145 39.8	−24 36.9	82 37.4	−24 27.7	257 24.5	+20 48.1	159 51.7	−12 24.7	45 25.6	111	− 7 27.2	+141
1	32 07.1	160 40.9	37.4	97 38.2	27.3	272 26.7	48.0	174 53.8	24.8	59 55.7	110	7 13.1	+142
2	47 09.6	175 42.1	37.9	112 39.0	27.0	287 28.8	48.0	189 56.0	24.9	74 25.7	111	6 58.9	+142
3	62 12.0	190 43.2	•• 38.4	127 39.9	•• 26.7	302 31.0	•• 47.9	204 58.2	•• 25.0	88 55.8	110	· 6 44.7	+143
4	77 14.5	205 44.3	38.9	142 40.7	26.4	317 33.1	47.9	220 00.4	25.1	103 25.8	110	6 30.4	+144
5	92 17.0	220 45.4	39.4	157 41.5	26.0	332 35.3	47.8	235 02.6	25.2	117 55.8	110	6 16.0	+144
6	107 19.4	235 46.5	−24 39.9	172 42.4	−24 25.7	347 37.5	+20 47.8	250 04.8	−12 25.3	132 25.8	110	− 6 01.6	+144
7	122 21.9	250 47.7	40.4	187 43.2	25.4	2 39.6	47.7	265 07.0	25.4	146 55.8	110	5 47.2	+145
8	137 24.4	265 48.8	40.9	202 44.0	25.0	17 41.8	47.6	280 09.2	25.5	161 25.8	109	5 32.7	+146
9	152 26.8	280 49.9	•• 41.4	217 44.9	•• 24.7	32 43.9	•• 47.6	295 11.4	•• 25.6	175 55.7	109	· 5 18.1	+146
10	167 29.3	295 51.0	41.9	232 45.7	24.4	47 46.1	47.5	310 13.6	25.7	190 25.6	109	5 03.5	+146
11	182 31.7	310 52.2	42.4	247 46.5	24.0	62 48.3	47.5	325 15.7	25.8	204 55.5	109	4 48.9	+147
12	197 34.2	325 53.3	−24 42.9	262 47.4	−24 23.7	77 50.4	+20 47.4	340 17.9	−12 25.9	219 25.4	109	− 4 34.2	+147
13	212 36.7	340 54.4	43.4	277 48.2	23.4	92 52.6	47.4	355 20.1	25.9	233 55.3	108	4 19.5	+148
14	227 39.1	355 55.6	43.9	292 49.0	23.0	107 54.8	47.3	10 22.3	26.0	248 25.1	109	4 04.7	+14[illegible]
15	242 41.6	10 56.7	•• 44.4	307 49.9	•• 22.7	122 56.9	•• 47.3	25 24.5	•• 26.1	262 55.0	108	· 3 49.9	+149
16	257 44.1	25 57.9	44.9	322 50.7	22.4	137 59.1	47.2	40 26.7	26.2	277 24.8	107	3 35.0	+149
17	272 46.5	40 59.0	45.3	337 51.5	22.0	153 01.2	47.2	55 28.9	26.3	291 54.5	108	3 20.1	+149
18	287 49.0	56 00.2	−24 45.8	352 52.4	−24 21.7	168 03.4	+20 47.1	70 31.1	−12 26.4	306 24.3	107	− 3 05.2	+150
19	302 51.5	71 01.3	46.3	7 53.2	21.4	183 05.6	47.1	85 33.3	26.5	320 54.0	107	2 50.2	+150
20	317 53.9	86 02.5	46.8	22 54.0	21.0	198 07.7	47.0	100 35.5	26.6	335 23.7	106	2 35.2	+150
21	332 56.4	101 03.6	•• 47.3	37 54.9	•• 20.7	213 09.9	•• 47.0	115 37.6	•• 26.7	349 53.3	107	· 2 20.2	+151
22	347 58.8	116 04.8	47.8	52 55.7	20.4	228 12.1	46.9	130 39.8	26.8	4 23.0	106	2 05.1	+151
23	3 01.3	131 06.0	48.3	67 56.5	20.0	243 14.2	46.9	145 42.0	26.9	18 52.6	105	1 50.0	+151
24	18 03.8	146 07.1	−24 48.7	82 57.3	−24 19.7	258 16.4	+20 46.8	160 44.2	−12 27.0	33 22.1	106	− 1 34.9	+151
code	—	+ 11	− 5	+ 8	+ 3	+ 22	− 1	+ 22	− 1				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
7 0	182 58.3	− 5 12.6
1	197 58.4	13.5
2	212 58.6	14.5
3	227 58.8	•• 15.5
4	242 59.0	16.4
5	257 59.2	17.4
6	272 59.4	− 5 18.3
7	287 59.5	19.3
8	302 59.7	20.3
9	317 59.9	•• 21.2
10	333 00.1	22.2
11	348 00.3	23.1
12	3 00.4	− 5 24.1
13	18 00.6	25.0
14	33 00.8	26.0
15	48 01.0	•• 27.0
16	63 01.2	27.9
17	78 01.3	28.9
18	93 01.5	− 5 29.8
19	108 01.7	30.8
20	123 01.9	31.7
21	138 02.1	•• 32.7
22	153 02.2	33.7
23	168 02.4	34.6
8 0	183 02.6	− 5 35.6
1	198 02.8	36.5
2	213 03.0	37.5
3	228 03.1	•• 38.4
4	243 03.3	39.4
5	258 03.5	40.4
6	273 03.7	− 5 41.3
7	288 03.8	42.3
8	303 04.0	43.2
9	318 04.2	•• 44.2
10	333 04.4	45.1
11	348 04.6	46.1
12	3 04.7	− 5 47.0
13	18 04.9	48.0
14	33 05.1	48.9
15	48 05.3	•• 49.9
16	63 05.4	50.9
17	78 05.6	51.8
18	93 05.8	− 5 52.8
19	108 06.0	53.7
20	123 06.1	54.7
21	138 06.3	•• 55.6
22	153 06.5	56.6
23	168 06.7	57.5
9 0	183 06.8	− 5 58.5
1	198 07.0	5 59.4
2	213 07.2	6 00.4
3	228 07.4	•• 01.3
4	243 07.5	02.3
5	258 07.7	03.2
6	273 07.9	− 6 04.2
7	288 08.1	05.2
8	303 08.2	06.1
9	318 08.4	•• 07.1
10	333 08.6	08.0
11	348 08.7	09.0
12	3 08.9	− 6 09.9
13	18 09.1	10.9
14	33 09.3	11.8
15	48 09.4	•• 12.8
16	63 09.6	13.7
17	78 09.8	14.7
18	93 09.9	− 6 15.6
19	108 10.1	16.6
20	123 10.3	17.5
21	138 10.5	•• 18.5
22	153 10.6	19.4
23	168 10.8	20.4
24	183 11.0	− 6 21.3
code	—	− 10

STARS No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.3	−40 28.8
5	Achernar	335 58.7	−57 27.7
30	Acrux	173 59.4	−62 50.9
19	Adhara	255 47.1	−28 54.3
10	Aldebaran	291 39.7	+16 25.3
32	Alioth	166 59.6	+56 12.3
34	Alkaid	153 33.9	+49 32.3
55	Al Na'ir	28 38.5	−47 10.9
15	Alnilam	276 30.9	− 1 13.6
25	Alphard	218 39.5	− 8 27.6
41	Alphecca	126 48.5	+26 52.1
1	Alpheratz	358 28.8	+28 50.7
51	Altair	62 51.1	+ 8 45.0
2	Ankaa	353 58.5	−42 32.9
42	Antares	113 20.5	−26 20.1
37	Arcturus	146 36.1	+19 25.1
43	Atria	109 02.2	−68 57.1
22	Avior	234 36.3	−59 21.5
13	Bellatrix	279 19.1	+ 6 18.8
16	Betelg'se	271 48.8	+ 7 24.2
17	Canopus	264 15.6	−52 39.9
12	Capella	281 39.3	+45 57.2
53	Deneb	50 01.3	+45 07.4
28	Denebola	183 18.8	+14 49.5
4	Diphda	349 39.6	−18 13.8
27	Dubhe	194 45.9	+61 59.6
14	Elnath	279 08.1	+28 34.3
47	Eltanin	91 06.7	+51 29.9
54	Enif	34 30.1	+ 9 40.2
56	Fomalhaut	16 12.1	−29 51.6
31	Gacrux	172 50.7	−56 51.6
29	Gienah	176 37.9	−17 17.4
35	Hadar	149 51.2	−60 09.5
6	Hamal	328 50.1	+23 15.2
48	Kaus Aust.	84 42.2	−34 24.6
40	Kochab	137 18.8	+74 20.5
57	Markab	14 21.9	+14 58.0
8	Menkar	315 00.8	+ 3 55.0
36	Menkent	148 59.9	−36 09.0
24	Miapl'dus	221 49.8	−69 31.6
9	Mirfak	309 43.1	+49 42.2
50	Nunki	76 52.8	−26 21.3
52	Peacock	54 28.2	−56 53.1
21	Pollux	244 21.5	+28 08.2
20	Procyon	245 45.8	+ 5 20.6
46	R'alhague	96 47.4	+12 35.6
26	Regulus	208 30.5	+12 11.3
11	Rigel	281 54.2	− 8 14.9
38	Rigil Kent.	140 52.7	−60 39.2
44	Sabik	103 03.2	−15 40.2
3	Schedar	350 30.3	+56 17.6
45	Shaula	97 21.8	−37 04.5
18	Sirius	259 12.5	−16 38.9
33	Spica	159 18.0	−10 55.5
23	Suhail	223 25.1	−43 14.7
49	Vega	81 08.8	+38 44.7
39	Zub'g'bi	137 54.5	−15 51.3

Lat.	Sunrise	Twlt. begins	Moonrise 7	8	9	10
°	h m	h m	h m	h m	h m	h m
N 72	6 48	2 47	17 23	16 45	16 17	15 51
70	6 42	3 07	16 55	16 31	16 12	15 54
68	6 36	3 22	16 34	16 19	16 08	15 56
66	6 31	3 34	16 17	16 10	16 04	15 59
64	6 27	3 44	16 03	16 02	16 01	16 00
62	6 24	3 52	15 51	15 55	15 59	16 02
60	6 21	4 00	15 41	15 49	15 57	16 03
58	6 18	4 05	15 32	15 44	15 55	16 05
56	6 16	4 10	15 25	15 39	15 53	16 06
54	6 14	4 14	15 18	15 35	15 51	16 07
52	6 12	4 18	15 11	15 31	15 50	16 08
50	6 10	4 21	15 06	15 28	15 48	16 09
45	6 06	4 28	14 53	15 20	15 45	16 11
40	6 03	4 32	14 43	15 14	15 43	16 12
35	6 00	4 35	14 35	15 08	15 41	16 13
30	5 57	4 37	14 27	15 03	15 39	16 15
20	5 53	4 39	14 14	14 55	15 36	16 17
10	5 48	4 38	14 02	14 47	15 33	16 19
0	5 44	4 36	13 51	14 40	15 30	16 21
10	5 40	4 31	13 40	14 33	15 27	16 23
20	5 36	4 23	13 28	14 26	15 24	16 25
30	5 31	4 11	13 14	14 17	15 21	16 27
35	5 27	4 02	13 06	14 12	15 19	16 28
40	5 24	3 53	12 57	14 06	15 17	16 30
45	5 20	3 39	12 47	14 00	15 15	16 32
50	5 15	3 21	12 34	13 52	15 12	16 34
52	5 13	3 13	12 28	13 48	15 10	16 35
54	5 10	3 03	12 21	13 44	15 09	16 36
56	5 08	2 51	12 14	13 39	15 07	16 38
58	5 05	2 37	12 05	13 34	15 05	16 39
S 60	5 01	2 21	11 56	13 28	15 03	16 41

Lat.	Sunset	Twlt. ends	Moonset 7	8	9	10
°	h m	h m	h m	h m	h m	h m
N 72	16 45	20 40	23 06	25 29	1 29	3 44
70	16 52	20 22	23 32	25 40	1 40	3 45
68	16 58	20 08	23 52	25 49	1 49	3 46
66	17 02	19 55	24 07	0 07	1 57	3 47
64	17 06	19 46	24 20	0 20	2 03	3 48
62	17 10	19 39	24 30	0 30	2 08	3 48
60	17 13	19 32	24 39	0 39	2 13	3 49
58	17 16	19 27	24 47	0 47	2 17	3 49
56	17 18	19 22	24 54	0 54	2 20	3 49
54	17 21	19 19	25 00	1 00	2 24	3 50
52	17 23	19 15	25 06	1 06	2 27	3 50
50	17 25	19 12	25 11	1 11	2 29	3 50
45	17 29	19 06	0 10	1 21	2 35	3 51
40	17 32	19 02	0 22	1 30	2 40	3 52
35	17 35	18 59	0 33	1 38	2 44	3 52
30	17 38	18 57	0 42	1 44	2 47	3 52
20	17 43	18 56	0 58	1 55	2 54	3 53
10	17 47	18 57	1 12	2 05	2 59	3 53
0	17 51	19 00	1 25	2 14	3 04	3 54
10	17 55	19 05	1 38	2 24	3 09	3 54
20	18 00	19 14	1 51	2 33	3 14	3 55
30	18 05	19 26	2 07	2 44	3 20	3 55
35	18 08	19 35	2 16	2 50	3 23	3 55
40	18 12	19 46	2 26	2 57	3 27	3 56
45	18 16	19 59	2 37	3 05	3 31	3 56
50	18 21	20 17	2 52	3 15	3 36	3 56
52	18 24	20 27	2 58	3 20	3 39	3 56
54	18 26	20 36	3 06	3 25	3 41	3 57
56	18 29	20 49	3 14	3 30	3 44	3 57
58	18 32	21 03	3 23	3 36	3 47	3 57
S 60	18 36	21 21	3 33	3 43	3 51	3 57

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.3	0.3	0.2
30	0.3	0.3	0.1
45	0.3	0.2	0.1
60	0.3	0.1	0.1
75	0.3	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	7	8	9
°	′	′	′
0	16.2	17.5	18.6
4	16.2	17.5	18.6
8	16.2	17.4	18.6
12	16.2	17.4	18.5
16	16.2	17.4	18.5
20	16.2	17.4	18.4
24	16.1	17.3	18.4
28	16.1	17.3	18.3
32	16.1	17.2	18.2
36	16.1	17.1	18.1
40	16.1	17.1	18.0
44	16.0	17.0	17.9
48	16.0	16.9	17.7
52	16.0	16.8	17.6
56	16.0	16.8	17.5
60	15.9	16.7	17.3
64	15.9	16.6	17.2
68	15.9	16.5	17.0
72	15.8	16.4	16.9
76	15.8	16.3	16.7
80	15.8	16.2	16.5
84	15.7	16.1	16.4
88	15.7	16.0	16.2
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	7	8	9
°	′	′	′
0	15.2	14.5	13.8
4	15.2	14.5	13.8
8	15.2	14.5	13.8
12	15.2	14.5	13.9
16	15.2	14.5	13.9
20	15.2	14.6	14.0
24	15.2	14.6	14.0
28	15.3	14.7	14.1
32	15.3	14.7	14.2
36	15.3	14.8	14.3
40	15.3	14.8	14.4
44	15.3	14.9	14.5
48	15.4	15.0	14.7
52	15.4	15.1	14.8
56	15.4	15.2	14.9
60	15.5	15.3	15.1
64	15.5	15.3	15.2
68	15.5	15.4	15.4
72	15.5	15.5	15.5
76	15.6	15.6	15.7
80	15.6	15.8	15.9
84	15.7	15.9	16.0
88	15.7	15.9	16.2
90			

Subtract from table, back cover

Equation of Time (App.—Mean)

GMT	7	8	9
h	m s	m s	m s
0	+11 52.7	+12 10.0	+12 27.0
6	+11 57.1	+12 14.3	+12 31.2
12	+12 01.4	+12 18.6	+12 35.3
18	+12 05.7	+12 22.8	+12 39.4
24	+12 10.0	+12 27.0	+12 43.5

GMT of Transit
Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
7	20 03	14 20	18 31	6 56	13 26
8	20 52	14 18	18 30	6 53	13 22
9	21 42	14 16	18 29	6 49	13 19
10	22 33	14 14	18 27	6 46	13 15

Day of Atonement (Yom Kippur) 7

GMT	♈	VENUS −4.3		MARS −0.2		JUPITER −1.7		SATURN 0.8		MOON			
	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
10 0	18 03.8	146 07.1	−24 48.7	82 57.3	−24 19.7	258 16.4	+20 46.8	160 44.2	−12 27.0	33 22.1	106	− 1 34.9	+151
1	33 06.2	161 08.3	49.2	97 58.2	19.4	273 18.6	46.8	175 46.4	27.1	47 51.7	105	1 19.8	+152
2	48 08.7	176 09.5	49.7	112 59.0	19.0	288 20.7	46.7	190 48.6	27.2	62 21.2	105	1 04.6	+152
3	63 11.2	191 10.6	•• 50.2	127 59.8	•• 18.7	303 22.9	•• 46.7	205 50.8	•• 27.3	76 50.7	104	· 0 49.4	+152
4	78 13.6	206 11.8	50.6	143 00.7	18.4	318 25.1	46.6	220 53.0	27.4	91 20.1	104	0 34.2	+153
5	93 16.1	221 13.0	51.1	158 01.5	18.0	333 27.2	46.6	235 55.2	27.5	105 49.5	104	0 18.9	+153
6	108 18.6	236 14.2	−24 51.6	173 02.3	−24 17.7	348 29.4	+20 46.5	250 57.3	−12 27.5	120 18.9	103	− 0 03.6	+152
7	123 21.0	251 15.4	52.1	188 03.2	17.3	3 31.6	46.5	265 59.5	27.6	134 48.2	103	+ 0 11.6	+153
8	138 23.5	266 16.5	52.5	203 04.0	17.0	18 33.7	46.4	281 01.7	27.7	149 17.5	102	0 26.9	+153
9	153 26.0	281 17.7	•• 53.0	218 04.8	•• 16.7	33 35.9	•• 46.4	296 03.9	•• 27.8	163 46.7	102	· 0 42.2	+154
10	168 28.4	296 18.9	53.5	233 05.6	16.3	48 38.1	46.3	311 06.1	27.9	178 15.9	102	0 57.6	+153
11	183 30.9	311 20.1	53.9	248 06.5	16.0	63 40.2	46.3	326 08.3	28.0	192 45.1	101	1 12.9	+153
12	198 33.3	326 21.3	−24 54.4	263 07.3	−24 15.6	78 42.4	+20 46.2	341 10.5	−12 28.1	207 14.2	101	+ 1 28.2	+154
13	213 35.8	341 22.5	54.9	278 08.1	15.3	93 44.6	46.2	356 12.7	28.2	221 43.3	100	1 43.6	+154
14	228 38.3	356 23.7	55.3	293 08.9	15.0	108 46.8	46.1	11 14.9	28.3	236 12.3	100	1 59.0	+153
15	243 40.7	11 24.9	•• 55.8	308 09.8	•• 14.6	123 48.9	•• 46.1	26 17.0	•• 28.4	250 41.3	99	· 2 14.3	+154
16	258 43.2	26 26.1	56.3	323 10.6	14.3	138 51.1	46.0	41 19.2	28.5	265 10.2	99	2 29.7	+153
17	273 45.7	41 27.3	56.7	338 11.4	13.9	153 53.3	46.0	56 21.4	28.6	279 39.1	99	2 45.0	+154
18	288 48.1	56 28.5	−24 57.2	353 12.3	−24 13.6	168 55.4	+20 45.9	71 23.6	−12 28.7	294 08.0	98	+ 3 00.4	+154
19	303 50.6	71 29.7	57.7	8 13.1	13.3	183 57.6	45.9	86 25.8	28.8	308 36.8	97	3 15.8	+153
20	318 53.1	86 31.0	58.1	23 13.9	12.9	198 59.8	45.8	101 28.0	28.9	323 05.5	97	3 31.1	+154
21	333 55.5	101 32.2	•• 58.6	38 14.7	•• 12.6	214 02.0	•• 45.8	116 30.2	•• 29.0	337 34.2	96	· 3 46.5	+153
22	348 58.0	116 33.4	59.0	53 15.6	12.2	229 04.1	45.7	131 32.4	29.0	352 02.8	96	4 01.8	+154
23	4 00.5	131 34.6	59.5	68 16.4	11.9	244 06.3	45.7	146 34.5	29.1	6 31.4	96	4 17.2	+153
11 0	19 02.9	146 35.9	−24 59.9	83 17.2	−24 11.5	259 08.5	+20 45.6	161 36.7	−12 29.2	21 00.0	94	+ 4 32.5	+153
1	34 05.4	161 37.1	25 00.4	98 18.0	11.2	274 10.6	45.6	176 38.9	29.3	35 28.4	95	4 47.8	+153
2	49 07.8	176 38.3	00.8	113 18.9	10.9	289 12.8	45.5	191 41.1	29.4	49 56.9	93	5 03.1	+153
3	64 10.3	191 39.5	•• 01.3	128 19.7	•• 10.5	304 15.0	•• 45.5	206 43.3	•• 29.5	64 25.2	93	· 5 18.4	+152
4	79 12.8	206 40.8	01.7	143 20.5	10.2	319 17.2	45.4	221 45.5	29.6	78 53.5	93	5 33.6	+153
5	94 15.2	221 42.0	02.2	158 21.3	09.8	334 19.3	45.4	236 47.7	29.7	93 21.8	92	5 48.9	+152
6	109 17.7	236 43.3	−25 02.6	173 22.1	−24 09.5	349 21.5	+20 45.3	251 49.9	−12 29.8	107 50.0	91	+ 6 04.1	+152
7	124 20.2	251 44.5	03.1	188 23.0	09.1	4 23.7	45.3	266 52.0	29.9	122 18.1	91	6 19.3	+152
8	139 22.6	266 45.8	03.5	203 23.8	08.8	19 25.9	45.2	281 54.2	30.0	136 46.2	90	6 34.5	+151
9	154 25.1	281 47.0	•• 04.0	218 24.6	•• 08.4	34 28.0	•• 45.2	296 56.4	•• 30.1	151 14.2	89	· 6 49.6	+151
10	169 27.6	296 48.3	04.4	233 25.4	08.1	49 30.2	45.2	311 58.6	30.2	165 42.1	89	7 04.7	+151
11	184 30.0	311 49.5	04.9	248 26.3	07.7	64 32.4	45.1	327 00.8	30.3	180 10.0	88	7 19.8	+150
12	199 32.5	326 50.8	−25 05.3	263 27.1	−24 07.4	79 34.6	+20 45.1	342 03.0	−12 30.4	194 37.8	88	+ 7 34.8	+151
13	214 34.9	341 52.0	05.7	278 27.9	07.1	94 36.7	45.0	357 05.2	30.5	209 05.6	87	7 49.9	+149
14	229 37.4	356 53.3	06.2	293 28.7	06.7	109 38.9	45.0	12 07.4	30.6	223 33.3	86	8 04.8	+150
15	244 39.9	11 54.6	•• 06.6	308 29.5	•• 06.4	124 41.1	•• 44.9	27 09.5	•• 30.6	238 00.9	86	· 8 19.8	+148
16	259 42.3	26 55.8	07.1	323 30.4	06.0	139 43.3	44.9	42 11.7	30.7	252 28.5	84	8 34.6	+149
17	274 44.8	41 57.1	07.5	338 31.2	05.7	154 45.4	44.8	57 13.9	30.8	266 55.9	85	8 49.5	+148
18	289 47.3	56 58.4	−25 07.9	353 32.0	−24 05.3	169 47.6	+20 44.8	72 16.1	−12 30.9	281 23.4	83	+ 9 04.3	+148
19	304 49.7	71 59.7	08.4	8 32.8	05.0	184 49.8	44.7	87 18.3	31.0	295 50.7	83	9 19.1	+147
20	319 52.2	87 00.9	08.8	23 33.6	04.6	199 52.0	44.7	102 20.5	31.1	310 18.0	82	9 33.8	+146
21	334 54.7	102 02.2	•• 09.2	38 34.5	•• 04.3	214 54.2	•• 44.6	117 22.7	•• 31.2	324 45.2	81	· 9 48.4	+146
22	349 57.1	117 03.5	09.6	53 35.3	03.9	229 56.3	44.6	132 24.9	31.3	339 12.3	81	10 03.0	+146
23	4 59.6	132 04.8	10.1	68 36.1	03.6	244 58.5	44.5	147 27.0	31.4	353 39.4	80	10 17.6	+144
12 0	20 02.1	147 06.1	−25 10.5	83 36.9	−24 03.2	260 00.7	+20 44.5	162 29.2	−12 31.5	8 06.4	79	+10 32.0	+145
1	35 04.5	162 07.4	10.9	98 37.7	02.9	275 02.9	44.4	177 31.4	31.6	22 33.3	79	10 46.5	+143
2	50 07.0	177 08.7	11.3	113 38.6	02.5	290 05.0	44.4	192 33.6	31.7	37 00.2	78	11 00.8	+143
3	65 09.4	192 10.0	•• 11.8	128 39.4	•• 02.2	305 07.2	•• 44.3	207 35.8	•• 31.8	51 27.0	77	·11 15.1	+143
4	80 11.9	207 11.3	12.2	143 40.2	01.8	320 09.4	44.3	222 38.0	31.9	65 53.7	76	11 29.4	+142
5	95 14.4	222 12.6	12.6	158 41.0	01.5	335 11.6	44.2	237 40.2	32.0	80 20.3	75	11 43.6	+141
6	110 16.8	237 13.9	−25 13.0	173 41.8	−24 01.1	350 13.8	+20 44.2	252 42.3	−12 32.1	94 46.8	75	+11 57.7	+140
7	125 19.3	252 15.2	13.5	188 42.7	00.7	5 16.0	44.1	267 44.5	32.2	109 13.3	74	12 11.7	+139
8	140 21.8	267 16.5	13.9	203 43.5	00.4	20 18.1	44.1	282 46.7	32.2	123 39.7	73	12 25.6	+139
9	155 24.2	282 17.8	•• 14.3	218 44.3	·24 00.0	35 20.3	•• 44.0	297 48.9	•• 32.3	138 06.0	73	·12 39.5	+138
10	170 26.7	297 19.2	14.7	233 45.1	23 59.7	50 22.5	44.0	312 51.1	32.4	152 32.3	72	12 53.3	+137
11	185 29.2	312 20.5	15.1	248 45.9	59.3	65 24.7	43.9	327 53.3	32.5	166 58.5	71	13 07.0	+137
12	200 31.6	327 21.8	−25 15.5	263 46.7	−23 59.0	80 26.9	+20 43.9	342 55.5	−12 32.6	181 24.6	70	+13 20.7	+135
13	215 34.1	342 23.1	15.9	278 47.6	58.6	95 29.0	43.9	357 57.7	32.7	195 50.6	69	13 34.2	+135
14	230 36.5	357 24.5	16.4	293 48.4	58.3	110 31.2	43.8	12 59.8	32.8	210 16.5	69	13 47.7	+134
15	245 39.0	12 25.8	•• 16.8	308 49.2	•• 57.9	125 33.4	•• 43.8	28 02.0	•• 32.9	224 42.4	68	·14 01.1	+133
16	260 41.5	27 27.1	17.2	323 50.0	57.6	140 35.6	43.7	43 04.2	33.0	239 08.2	67	14 14.4	+132
17	275 43.9	42 28.5	17.6	338 50.8	57.2	155 37.8	43.7	58 06.4	33.1	253 33.9	66	14 27.6	+131
18	290 46.4	57 29.8	−25 18.0	353 51.6	−23 56.8	170 40.0	+20 43.6	73 08.6	−12 33.2	267 59.5	65	+14 40.7	+130
19	305 48.9	72 31.2	18.4	8 52.4	56.5	185 42.1	43.6	88 10.8	33.3	282 25.0	65	14 53.7	+129
20	320 51.3	87 32.5	18.8	23 53.3	56.1	200 44.3	43.5	103 13.0	33.4	296 50.5	64	15 06.6	+128
21	335 53.8	102 33.8	•• 19.2	38 54.1	•• 55.8	215 46.5	•• 43.5	118 15.1	•• 33.5	311 15.9	63	·15 19.4	+128
22	350 56.3	117 35.2	19.6	53 54.9	55.4	230 48.7	43.4	133 17.3	33.6	325 41.2	63	15 32.2	+126
23	5 58.7	132 36.6	20.0	68 55.7	55.1	245 50.9	43.4	148 19.5	33.7	340 06.5	61	15 44.8	+125
24	21 01.2	147 37.9	−25 20.4	83 56.5	−23 54.7	260 53.1	+20 43.3	163 21.7	−12 33.8	354 31.6	61	+15 57.3	+124
code	—	+ 12	− 4	+ 8	+ 3	+ 21	− 1	+ 22	− 1				

GMT	SUN GHA	Dec.
h	° ′	° ′
10 0	183 11.0	− 6 21.3
1	198 11.1	22.3
2	213 11.3	23.2
3	228 11.5 ••	24.2
4	243 11.6	25.1
5	258 11.8	26.1
6	273 12.0	− 6 27.0
7	288 12.2	28.0
8	303 12.3	28.9
9	318 12.5 ••	29.9
10	333 12.7	30.8
11	348 12.8	31.8
12	3 13.0	− 6 32.7
13	18 13.2	33.7
14	33 13.3	34.6
15	48 13.5 ••	35.6
16	63 13.7	36.5
17	78 13.8	37.4
18	93 14.0	− 6 38.4
19	108 14.2	39.3
20	123 14.3	40.3
21	138 14.5 ••	41.2
22	153 14.7	42.2
23	168 14.8	43.1
11 0	183 15.0	− 6 44.1
1	198 15.2	45.0
2	213 15.3	46.0
3	228 15.5 ••	46.9
4	243 15.6	47.9
5	258 15.8	48.8
6	273 16.0	− 6 49.7
7	288 16.1	50.7
8	303 16.3	51.6
9	318 16.5 ••	52.6
10	333 16.6	53.5
11	348 16.8	54.5
12	3 17.0	− 6 55.4
13	18 17.1	56.4
14	33 17.3	57.3
15	48 17.4 ••	58.2
16	63 17.6	6 59.2
17	78 17.8	7 00.1
18	93 17.9	− 7 01.1
19	108 18.1	02.0
20	123 18.2	03.0
21	138 18.4 ••	03.9
22	153 18.6	04.8
23	168 18.7	05.8
12 0	183 18.9	− 7 06.7
1	198 19.1	07.7
2	213 19.2	08.6
3	228 19.4 ••	09.6
4	243 19.5	10.5
5	258 19.7	11.4
6	273 19.8	− 7 12.4
7	288 20.0	13.3
8	303 20.2	14.3
9	318 20.3 ••	15.2
10	333 20.5	16.1
11	348 20.6	17.1
12	3 20.8	− 7 18.0
13	18 21.0	19.0
14	33 21.1	19.9
15	48 21.3 ••	20.8
16	63 21.4	21.8
17	78 21.6	22.7
18	93 21.7	− 7 23.7
19	108 21.9	24.6
20	123 22.1	25.5
21	138 22.2 ••	26.5
22	153 22.4	27.4
23	168 22.5	28.4
24	183 22.7	− 7 29.3
code	—	− 10

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.2	−40 28.8
5	Achernar	335 58.7	−57 27.7
30	Acrux	173 59.4	−62 50.9
19	Adhara	255 47.1	−28 54.3
10	Aldebaran	291 39.7	+16 25.3
32	Alioth	166 59.6	+56 12.2
34	Alkaid	153 33.9	+49 32.3
55	Al Na'ir	28 38.5	−47 10.9
15	Alnilam	276 30.9	− 1 13.6
25	Alphard	218 39.5	− 8 27.6
41	Alphecca	126 48.5	+26 52.1
1	Alpheratz	358 28.8	+28 50.7
51	Altair	62 51.1	+ 8 45.0
2	Ankaa	353 58.5	−42 32.9
42	Antares	113 20.5	−26 20.1
37	Arcturus	146 36.1	+19 25.1
43	Atria	109 02.2	−68 57.1
22	Avior	234 36.3	−59 21.5
13	Bellatrix	279 19.0	+ 6 18.8
16	Betelg'se	271 48.8	+ 7 24.1
17	Canopus	264 15.6	−52 39.9
12	Capella	281 39.3	+45 57.2
53	Deneb	50 01.4	+45 07.4
28	Denebola	183 18.7	+14 49.5
4	Diphda	349 39.6	−18 13.9
27	Dubhe	194 45.9	+61 59.5
14	Elnath	279 08.1	+28 34.3
47	Eltanin	91 06.8	+51 29.9
54	Enif	34 30.1	+ 9 40.3
56	Fomalhaut	16 12.1	−29 51.6
31	Gacrux	172 50.7	−56 51.6
29	Gienah	176 37.9	−17 17.4
35	Hadar	149 51.2	−60 09.4
6	Hamal	328 50.1	+23 15.2
48	Kaus Aust.	84 42.2	−34 24.6
40	Kochab	137 18.8	+74 20.5
57	Markab	14 21.9	+14 58.0
8	Menkar	315 00.8	+ 3 55.0
36	Menkent	148 59.9	−36 08.9
24	Miapl'dus	221 49.8	−69 31.6
9	Mirfak	309 43.0	+49 42.2
50	Nunki	76 52.8	−26 21.3
52	Peacock	54 28.2	−56 53.1
21	Pollux	244 21.5	+28 08.2
20	Procyon	245 45.8	+ 5 20.6
46	R'alhague	96 47.4	+12 35.6
26	Regulus	208 30.5	+12 11.3
11	Rigel	281 54.2	− 8 14.9
38	Rigil Kent.	140 52.7	−60 39.2
44	Sabik	103 03.2	−15 40.2
3	Schedar	350 30.3	+56 17.6
45	Shaula	97 21.8	−37 04.5
18	Sirius	259 12.4	−16 38.9
33	Spica	159 18.0	−10 55.5
23	Suhail	223 25.1	−43 14.7
49	Vega	81 08.8	+38 44.7
39	Zub'g'bi	137 54.5	−15 51.3

Lat.	Sunrise	Twlt. begins	Moonrise 10	11	12	13
N °	h m	h m	h m	h m	h m	h m
72	7 02	3 05	15 51	15 23	14 45	▭
70	6 54	3 22	15 54	15 35	15 11	14 27
68	6 47	3 34	15 56	15 45	15 31	15 10
66	6 41	3 45	15 59	15 53	15 47	15 40
64	6 36	3 54	16 00	16 00	16 00	16 02
62	6 32	4 01	16 02	16 06	16 11	16 20
60	6 28	4 07	16 03	16 11	16 21	16 35
58	6 25	4 12	16 05	16 16	16 30	16 48
56	6 22	4 16	16 06	16 20	16 37	16 59
54	6 19	4 19	16 07	16 24	16 44	17 09
52	6 17	4 23	16 08	16 27	16 50	17 18
50	6 15	4 26	16 09	16 30	16 55	17 26
45	6 10	4 32	16 11	16 37	17 07	17 43
40	6 06	4 35	16 12	16 43	17 17	17 57
35	6 02	4 37	16 13	16 48	17 26	18 09
30	5 59	4 39	16 15	16 52	17 33	18 19
20	5 53	4 40	16 17	17 00	17 47	18 37
10	5 48	4 38	16 19	17 07	17 58	18 53
0	5 44	4 35	16 21	17 13	18 09	19 08
10	5 39	4 28	16 23	17 20	18 20	19 23
20	5 33	4 20	16 25	17 27	18 32	19 39
30	5 27	4 06	16 27	17 35	18 46	19 58
35	5 23	3 58	16 28	17 40	18 54	20 09
40	5 19	3 47	16 30	17 45	19 03	20 22
45	5 15	3 32	16 32	17 52	19 14	20 36
50	5 09	3 14	16 34	17 59	19 27	20 55
52	5 06	3 04	16 35	18 03	19 33	21 04
54	5 03	2 53	16 36	18 07	19 40	21 13
56	5 00	2 40	16 38	18 11	19 48	21 25
58	4 56	2 25	16 39	18 16	19 57	21 37
60	4 52	2 06	16 41	18 22	20 07	21 52
S						

Lat.	Sunset	Twlt. ends	Moonset 10	11	12	13
N °	h m	h m	h m	h m	h m	h m
72	16 29	20 22	3 44	6 03	8 37	▭
70	16 38	20 06	3 45	5 54	8 13	10 59
68	16 45	19 53	3 46	5 47	7 55	10 17
66	16 51	19 43	3 47	5 41	7 40	9 48
64	16 56	19 35	3 48	5 36	7 29	9 27
62	17 00	19 28	3 48	5 31	7 19	9 10
60	17 04	19 23	3 49	5 28	7 10	8 56
58	17 08	19 19	3 49	5 24	7 03	8 43
56	17 11	19 15	3 49	5 21	6 56	8 33
54	17 13	19 11	3 50	5 19	6 50	8 24
52	17 16	19 08	3 50	5 16	6 45	8 16
50	17 18	19 05	3 50	5 14	6 40	8 08
45	17 23	19 00	3 51	5 09	6 30	7 53
40	17 27	18 57	3 52	5 06	6 22	7 40
35	17 31	18 55	3 52	5 02	6 15	7 29
30	17 34	18 53	3 52	4 59	6 09	7 20
20	17 40	18 53	3 53	4 54	5 58	7 04
10	17 45	18 55	3 53	4 50	5 48	6 50
0	17 50	18 59	3 54	4 45	5 39	6 37
10	17 55	19 06	3 54	4 41	5 31	6 24
20	18 01	19 16	3 55	4 37	5 21	6 10
30	18 07	19 29	3 55	4 32	5 11	5 54
35	18 11	19 38	3 55	4 29	5 04	5 45
40	18 15	19 50	3 56	4 25	4 57	5 34
45	18 20	20 04	3 56	4 22	4 49	5 22
50	18 26	20 24	3 56	4 17	4 40	5 07
52	18 29	20 34	3 56	4 15	4 35	5 00
54	18 32	20 45	3 57	4 13	4 30	4 53
56	18 35	20 58	3 57	4 10	4 25	4 44
58	18 39	21 14	3 57	4 07	4 19	4 35
60	18 43	21 35	3 57	4 04	4 12	4 24
S						

GMT	Equation of Time (App.—Mean) 10	11	12
h	m s	m s	m s
0	+12 43.5	+12 59.6	+13 15.3
6	+12 47.6	+13 03.6	+13 19.1
12	+12 51.6	+13 07.5	+13 22.9
18	+12 55.6	+13 11.4	+13 26.6
24	+12 59.6	+13 15.3	+13 30.4

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
10	22 33	14 14	18 27	6 46	13 15
11	23 26	14 12	18 26	6 43	13 12
12	24 23	14 10	18 25	6 39	13 08
13	0 23	14 08	18 23	6 36	13 05

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.3	0.3	0.2
30			
	0.3	0.3	0.1
45			
	0.3	0.2	0.1
60			
	0.3	0.1	0.1
75			
	0.3	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	10	11	12
°	′	′	′
0			
	19.6	20.5	20.9
4			
	19.6	20.5	20.9
8			
	19.6	20.5	20.8
12			
	19.5	20.4	20.8
16			
	19.5	20.3	20.7
20			
	19.4	20.2	20.6
24			
	19.3	20.1	20.5
28			
	19.2	20.0	20.3
32			
	19.1	19.8	20.2
36			
	18.9	19.7	20.0
40			
	18.8	19.5	19.8
44			
	18.6	19.3	19.6
48			
	18.5	19.1	19.4
52			
	18.3	18.9	19.2
56			
	18.1	18.7	18.9
60			
	17.9	18.4	18.7
64			
	17.7	18.2	18.4
68			
	17.5	17.9	18.1
72			
	17.3	17.7	17.9
76			
	17.1	17.4	17.6
80			
	16.9	17.2	17.3
84			
	16.6	16.9	17.0
88			
	16.5	16.7	16.8
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	10	11	12
°	′	′	′
0			
	13.2	12.7	12.5
4			
	13.2	12.7	12.5
8			
	13.3	12.8	12.6
12			
	13.3	12.8	12.6
16			
	13.4	12.9	12.7
20			
	13.5	13.0	12.8
24			
	13.5	13.1	12.9
28			
	13.6	13.2	13.1
32			
	13.8	13.4	13.2
36			
	13.9	13.5	13.4
40			
	14.0	13.7	13.6
44			
	14.2	13.9	13.8
48			
	14.4	14.1	14.0
52			
	14.5	14.3	14.2
56			
	14.7	14.5	14.5
60			
	14.9	14.8	14.7
64			
	15.1	15.0	15.0
68			
	15.3	15.3	15.3
72			
	15.5	15.5	15.5
76			
	15.8	15.8	15.8
80			
	16.0	16.1	16.1
84			
	16.2	16.3	16.4
88			
	16.4	16.5	16.6
90			

Subtract from table, back cover

Columbus Day 12
First Day of Feast of Tabernacles (Succoth) 12
Full Moon 12

GMT	♈ GHA	VENUS −4.3 GHA	Dec.	MARS −0.2 GHA	Dec.	JUPITER −1.8 GHA	Dec.	SATURN 0.8 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
13 0	21 01.2	147 37.9	−25 20.4	83 56.5	−23 54.7	260 53.1	+20 43.3	163 21.7	−12 33.8	354 31.6	61	+15 57.3	+124
1	36 03.7	162 39.3	20.8	98 57.3	54.3	275 55.3	43.3	178 23.9	33.8	8 56.7	60	16 09.7	+123
2	51 06.1	177 40.6	21.2	113 58.1	54.0	290 57.4	43.2	193 26.1	33.9	23 21.7	59	16 22.0	+121
3	66 08.6	192 42.0	·· 21.6	128 59.0	·· 53.6	305 59.6	·· 43.2	208 28.2	·· 34.0	37 46.6	59	·16 34.1	+121
4	81 11.0	207 43.4	22.0	143 59.8	53.3	321 01.8	43.1	223 30.4	34.1	52 11.5	57	16 46.2	+119
5	96 13.5	222 44.8	22.4	159 00.6	52.9	336 04.0	43.1	238 32.6	34.2	66 36.2	57	16 58.1	+119
6	111 16.0	237 46.1	−25 22.8	174 01.4	−23 52.5	351 06.2	+20 43.0	253 34.8	−12 34.3	81 00.9	57	+17 10.0	+117
7	126 18.4	252 47.5	23.2	189 02.2	52.2	6 08.4	43.0	268 37.0	34.4	95 25.6	55	17 21.7	+116
8	141 20.9	267 48.9	23.5	204 03.0	51.8	21 10.6	43.0	283 39.2	34.5	109 50.1	55	17 33.3	+114
9	156 23.4	282 50.3	·· 23.9	219 03.8	·· 51.5	36 12.8	·· 42.9	298 41.4	·· 34.6	124 14.6	54	·17 44.7	+114
10	171 25.8	297 51.7	24.3	234 04.6	51.1	51 14.9	42.9	313 43.5	34.7	138 39.0	53	17 56.1	+112
11	186 28.3	312 53.0	24.7	249 05.5	50.7	66 17.1	42.8	328 45.7	34.8	153 03.3	52	18 07.3	+111
12	201 30.8	327 54.4	−25 25.1	264 06.3	−23 50.4	81 19.3	+20 42.8	343 47.9	−12 34.9	167 27.5	52	+18 18.4	+110
13	216 33.2	342 55.8	25.5	279 07.1	50.0	96 21.5	42.7	358 50.1	35.0	181 51.7	51	18 29.4	+108
14	231 35.7	357 57.2	25.9	294 07.9	49.6	111 23.7	42.7	13 52.3	35.1	196 15.8	51	18 40.2	+107
15	246 38.2	12 58.6	·· 26.2	309 08.7	·· 49.3	126 25.9	·· 42.6	28 54.5	·· 35.2	210 39.9	49	·18 50.9	+105
16	261 40.6	28 00.0	26.6	324 09.5	48.9	141 28.1	42.6	43 56.7	35.3	225 03.8	49	19 01.4	+105
17	276 43.1	43 01.5	27.0	339 10.3	48.6	156 30.3	42.5	58 58.8	35.4	239 27.7	48	19 11.9	+102
18	291 45.5	58 02.9	−25 27.4	354 11.1	−23 48.2	171 32.5	+20 42.5	74 01.0	−12 35.5	253 51.5	48	+19 22.1	+102
19	306 48.0	73 04.3	27.8	9 11.9	47.8	186 34.7	42.4	89 03.2	35.5	268 15.3	47	19 32.3	+100
20	321 50.5	88 05.7	28.1	24 12.8	47.5	201 36.8	42.4	104 05.4	35.6	282 39.0	46	19 42.3	+ 98
21	336 52.9	103 07.1	·· 28.5	39 13.6	·· 47.1	216 39.0	·· 42.4	119 07.6	·· 35.7	297 02.6	46	·19 52.1	+ 98
22	351 55.4	118 08.5	28.9	54 14.4	46.7	231 41.2	42.3	134 09.8	35.8	311 26.2	45	20 01.9	+ 95
23	6 57.9	133 10.0	29.2	69 15.2	46.4	246 43.4	42.3	149 11.9	35.9	325 49.7	44	20 11.4	+ 94
14 0	22 00.3	148 11.4	−25 29.6	84 16.0	−23 46.0	261 45.6	+20 42.2	164 14.1	−12 36.0	340 13.1	44	+20 20.8	+ 93
1	37 02.8	163 12.8	30.0	99 16.8	45.6	276 47.8	42.2	179 16.3	36.1	354 36.5	43	20 30.1	+ 91
2	52 05.3	178 14.3	30.4	114 17.6	45.3	291 50.0	42.1	194 18.5	36.2	8 59.8	42	20 39.2	+ 90
3	67 07.7	193 15.7	·· 30.7	129 18.4	·· 44.9	306 52.2	·· 42.1	209 20.7	·· 36.3	23 23.0	42	·20 48.2	+ 88
4	82 10.2	208 17.1	31.1	144 19.2	44.5	321 54.4	42.0	224 22.9	36.4	37 46.2	42	20 57.0	+ 87
5	97 12.6	223 18.6	31.4	159 20.0	44.2	336 56.6	42.0	239 25.1	36.5	52 09.4	40	21 05.7	+ 85
6	112 15.1	238 20.0	−25 31.8	174 20.8	−23 43.8	351 58.8	+20 41.9	254 27.2	−12 36.6	66 32.4	41	+21 14.2	+ 83
7	127 17.6	253 21.5	32.2	189 21.6	43.4	7 01.0	41.9	269 29.4	36.7	80 55.5	40	21 22.5	+ 82
8	142 20.0	268 22.9	32.5	204 22.5	43.1	22 03.2	41.8	284 31.6	36.8	95 18.5	39	21 30.7	+ 80
9	157 22.5	283 24.4	·· 32.9	219 23.3	·· 42.7	37 05.4	·· 41.8	299 33.8	·· 36.9	109 41.4	39	·21 38.7	+ 79
10	172 25.0	298 25.8	33.2	234 24.1	42.3	52 07.6	41.8	314 36.0	37.0	124 04.3	38	21 46.6	+ 77
11	187 27.4	313 27.3	33.6	249 24.9	42.0	67 09.8	41.7	329 38.2	37.1	138 27.1	38	21 54.3	+ 76
12	202 29.9	328 28.8	−25 34.0	264 25.7	−23 41.6	82 12.0	+20 41.7	344 40.3	−12 37.1	152 49.9	37	+22 01.9	+ 73
13	217 32.4	343 30.2	34.3	279 26.5	41.2	97 14.1	41.6	359 42.5	37.2	167 12.6	37	22 09.2	+ 72
14	232 34.8	358 31.7	34.7	294 27.3	40.9	112 16.3	41.6	14 44.7	37.3	181 35.3	37	22 16.4	+ 71
15	247 37.3	13 33.2	·· 35.0	309 28.1	·· 40.5	127 18.5	·· 41.5	29 46.9	·· 37.4	195 58.0	36	·22 23.5	+ 69
16	262 39.8	28 34.7	35.4	324 28.9	40.1	142 20.7	41.5	44 49.1	37.5	210 20.6	36	22 30.4	+ 67
17	277 42.2	43 36.1	35.7	339 29.7	39.7	157 22.9	41.4	59 51.3	37.6	224 43.2	36	22 37.1	+ 65
18	292 44.7	58 37.6	−25 36.1	354 30.5	−23 39.4	172 25.1	+20 41.4	74 53.4	−12 37.7	239 05.8	35	+22 43.6	+ 64
19	307 47.1	73 39.1	36.4	9 31.3	39.0	187 27.3	41.3	89 55.6	37.8	253 28.3	35	22 50.0	+ 62
20	322 49.6	88 40.6	36.8	24 32.1	38.6	202 29.5	41.3	104 57.8	37.9	267 50.8	34	22 56.2	+ 60
21	337 52.1	103 42.1	·· 37.1	39 32.9	·· 38.3	217 31.7	·· 41.3	120 00.0	·· 38.0	282 13.2	34	·23 02.2	+ 58
22	352 54.5	118 43.6	37.5	54 33.7	37.9	232 33.9	41.2	135 02.2	38.1	296 35.6	34	23 08.0	+ 57
23	7 57.0	133 45.1	37.8	69 34.5	37.5	247 36.1	41.2	150 04.4	38.2	310 58.0	34	23 13.7	+ 55
15 0	22 59.5	148 46.6	−25 38.1	84 35.4	−23 37.1	262 38.3	+20 41.1	165 06.5	−12 38.3	325 20.4	34	+23 19.2	+ 53
1	38 01.9	163 48.1	38.5	99 36.2	36.8	277 40.5	41.1	180 08.7	38.4	339 42.8	33	23 24.5	+ 52
2	53 04.4	178 49.6	38.8	114 37.0	36.4	292 42.7	41.0	195 10.9	38.5	354 05.1	34	23 29.7	+ 50
3	68 06.9	193 51.1	·· 39.1	129 37.8	·· 36.0	307 44.9	·· 41.0	210 13.1	·· 38.6	8 27.5	33	·23 34.7	+ 48
4	83 09.3	208 52.6	39.5	144 38.6	35.6	322 47.1	40.9	225 15.3	38.7	22 49.8	33	23 39.5	+ 46
5	98 11.8	223 54.1	39.8	159 39.4	35.3	337 49.3	40.9	240 17.5	38.8	37 12.1	32	23 44.1	+ 44
6	113 14.3	238 55.7	−25 40.2	174 40.2	−23 34.9	352 51.5	+20 40.9	255 19.6	−12 38.8	51 34.3	33	+23 48.5	+ 43
7	128 16.7	253 57.2	40.5	189 41.0	34.5	7 53.7	40.8	270 21.8	38.9	65 56.6	33	23 52.8	+ 41
8	143 19.2	268 58.7	40.8	204 41.8	34.1	22 55.9	40.8	285 24.0	39.0	80 18.9	32	23 56.9	+ 39
9	158 21.6	284 00.2	·· 41.1	219 42.6	·· 33.8	37 58.1	·· 40.7	300 26.2	·· 39.1	94 41.1	33	·24 00.8	+ 37
10	173 24.1	299 01.8	41.5	234 43.4	33.4	53 00.3	40.7	315 28.4	39.2	109 03.4	33	24 04.5	+ 36
11	188 26.6	314 03.3	41.8	249 44.2	33.0	68 02.5	40.6	330 30.6	39.3	123 25.7	32	24 08.1	+ 34
12	203 29.0	329 04.8	−25 42.1	264 45.0	−23 32.6	83 04.7	+20 40.6	345 32.7	−12 39.4	137 47.9	33	+24 11.5	+ 32
13	218 31.5	344 06.4	42.4	279 45.8	32.3	98 06.9	40.5	0 34.9	39.5	152 10.2	33	24 14.7	+ 30
14	233 34.0	359 07.9	42.8	294 46.6	31.9	113 09.1	40.5	15 37.1	39.6	166 32.5	33	24 17.7	+ 28
15	248 36.4	14 09.5	·· 43.1	309 47.4	·· 31.5	128 11.4	·· 40.5	30 39.3	·· 39.7	180 54.8	33	·24 20.5	+ 27
16	263 38.9	29 11.0	43.4	324 48.2	31.1	143 13.6	40.4	45 41.5	39.8	195 17.1	33	24 23.2	+ 25
17	278 41.4	44 12.6	43.7	339 49.0	30.7	158 15.8	40.4	60 43.7	39.9	209 39.4	33	24 25.7	+ 23
18	293 43.8	59 14.1	−25 44.1	354 49.8	−23 30.4	173 18.0	+20 40.3	75 45.8	−12 40.0	224 01.7	34	+24 28.0	+ 21
19	308 46.3	74 15.7	44.4	9 50.6	30.0	188 20.2	40.3	90 48.0	40.1	238 24.1	33	24 30.1	+ 19
20	323 48.8	89 17.3	44.7	24 51.4	29.6	203 22.4	40.2	105 50.2	40.2	252 46.4	34	24 32.0	+ 18
21	338 51.2	104 18.8	·· 45.0	39 52.2	·· 29.2	218 24.6	·· 40.2	120 52.4	·· 40.3	267 08.8	34	·24 33.8	+ 16
22	353 53.7	119 20.4	45.3	54 53.0	28.8	233 26.8	40.1	135 54.6	40.4	281 31.2	35	24 35.4	+ 14
23	8 56.1	134 22.0	45.6	69 53.8	28.5	248 29.0	40.1	150 56.8	40.5	295 53.7	34	24 36.8	+ 12
24	23 58.6	149 23.6	−25 45.9	84 54.6	−23 28.1	263 31.2	+20 40.1	165 58.9	−12 40.5	310 16.1	35	+24 38.0	+ 10
code	–	+ 14	− 3	+ 8	+ 4	+ 21	− 1	+ 22	− 1				

GMT h	SUN GHA ° ′	SUN Dec. ° ′
13 0	183 22.7	− 7 29.3
1	198 22.8	30.2
2	213 23.0	31.2
3	228 23.1	•• 32.1
4	243 23.3	33.0
5	258 23.4	34.0
6	273 23.6	− 7 34.9
7	288 23.8	35.9
8	303 23.9	36.8
9	318 24.1	•• 37.7
10	333 24.2	38.7
11	348 24.4	39.6
12	3 24.5	− 7 40.5
13	18 24.7	41.5
14	33 24.8	42.4
15	48 25.0	•• 43.3
16	63 25.1	44.3
17	78 25.3	45.2
18	93 25.4	− 7 46.2
19	108 25.6	47.1
20	123 25.7	48.0
21	138 25.9	•• 49.0
22	153 26.0	49.9
23	168 26.2	50.8
14 0	183 26.3	− 7 51.8
1	198 26.5	52.7
2	213 26.6	53.6
3	228 26.8	•• 54.6
4	243 26.9	55.5
5	258 27.1	56.4
6	273 27.2	− 7 57.4
7	288 27.4	58.3
8	303 27.5	7 59.2
9	318 27.7	• 8 00.2
10	333 27.8	01.1
11	348 28.0	02.0
12	3 28.1	− 8 03.0
13	18 28.3	03.9
14	33 28.4	04.8
15	48 28.5	•• 05.7
16	63 28.7	06.7
17	78 28.8	07.6
18	93 29.0	− 8 08.5
19	108 29.1	09.5
20	123 29.3	10.4
21	138 29.4	•• 11.3
22	153 29.6	12.3
23	168 29.7	13.2
15 0	183 29.8	− 8 14.1
1	198 30.0	15.0
2	213 30.1	16.0
3	228 30.3	•• 16.9
4	243 30.4	17.8
5	258 30.6	18.8
6	273 30.7	− 8 19.7
7	288 30.9	20.6
8	303 31.0	21.5
9	318 31.1	•• 22.5
10	333 31.3	23.4
11	348 31.4	24.3
12	3 31.6	− 8 25.3
13	18 31.7	26.2
14	33 31.8	27.1
15	48 32.0	•• 28.0
16	63 32.1	29.0
17	78 32.3	29.9
18	93 32.4	− 8 30.8
19	108 32.5	31.7
20	123 32.7	32.7
21	138 32.8	•• 33.6
22	153 33.0	34.5
23	168 33.1	35.4
24	183 33.2	− 8 36.4
code	—	− 9

No.	STARS Name	SHA ° ′	Dec. ° ′
7	Acamar	315 51.2	−40 28.8
5	Achernar	335 58.7	−57 27.8
30	Acrux	173 59.4	−62 50.9
19	Adhara	255 47.1	−28 54.3
10	Aldebaran	291 39.7	+16 25.3
32	Alioth	166 59.6	+56 12.2
34	Alkaid	153 33.9	+49 32.3
55	Al Na'ir	28 38.5	−47 10.9
15	Alnilam	276 30.8	− 1 13.6
25	Alphard	218 39.5	− 8 27.6
41	Alphecca	126 48.5	+26 52.0
1	Alpheratz	358 28.8	+28 50.7
51	Altair	62 51.1	+ 8 45.0
2	Ankaa	353 58.5	−42 32.9
42	Antares	113 20.5	−26 20.1
37	Arcturus	146 36.1	+19 25.1
43	Atria	109 02.2	−68 57.1
22	Avior	234 36.3	−59 21.5
13	Bellatrix	279 19.0	+ 6 18.8
16	Betelg'se	271 48.8	+ 7 24.1
17	Canopus	264 15.5	−52 39.9
12	Capella	281 39.2	+45 57.2
53	Deneb	50 01.4	+45 07.4
28	Denebola	183 18.7	+14 49.5
4	Diphda	349 39.6	−18 13.9
27	Dubhe	194 45.9	+61 59.5
14	Elnath	279 08.0	+28 34.3
47	Eltanin	91 06.8	+51 29.9
54	Enif	34 30.1	+ 9 40.3
56	Fomalhaut	16 12.1	−29 51.6
31	Gacrux	172 50.7	−56 51.6
29	Gienah	176 37.9	−17 17.4
35	Hadar	149 51.2	−60 09.4
6	Hamal	328 50.1	+23 15.2
48	Kaus Aust.	84 42.2	−34 24.6
40	Kochab	137 18.8	+74 20.5
57	Markab	14 21.9	+14 58.0
8	Menkar	315 00.8	+ 3 55.0
36	Menkent	148 59.9	−36 08.9
24	Miapl'dus	221 49.7	−69 31.6
9	Mirfak	309 43.0	+49 42.2
50	Nunki	76 52.8	−26 21.3
52	Peacock	54 28.2	−56 53.1
21	Pollux	244 21.5	+28 08.2
20	Procyon	245 45.7	+ 5 20.6
46	R'alhague	96 47.4	+12 35.6
26	Regulus	208 30.5	+12 11.3
11	Rigel	281 54.1	− 8 14.9
38	Rigil Kent.	140 52.7	−60 39.2
44	Sabik	103 03.2	−15 40.2
3	Schedar	350 30.3	+56 17.6
45	Shaula	97 21.9	−37 04.5
18	Sirius	259 12.4	−16 38.9
33	Spica	159 18.0	−10 55.5
23	Suhail	223 25.1	−43 14.7
49	Vega	81 08.9	+38 44.7
39	Zub'g'bi	137 54.5	−15 51.3

Lat. °	Sunrise h m	Twlt. begins h m	Moonrise 13 h m	Moonrise 14 h m	Moonrise 15 h m	Moonrise 16 h m
N 72	7 17	3 21	□	□	□	□
70	7 06	3 35	14 27	□	□	□
68	6 58	3 46	15 10	□	□	□
66	6 51	3 56	15 40	15 30	□	□
64	6 45	4 03	16 02	16 09	16 31	17 29
62	6 40	4 09	16 20	16 37	17 10	18 11
60	6 36	4 14	16 35	16 58	17 38	18 39
58	6 32	4 18	16 48	17 16	17 59	19 01
56	6 28	4 22	16 59	17 31	18 17	19 19
54	6 25	4 25	17 09	17 44	18 32	19 34
52	6 22	4 28	17 18	17 55	18 45	19 47
50	6 19	4 31	17 26	18 05	18 56	19 58
45	6 14	4 35	17 43	18 27	19 20	20 22
40	6 09	4 38	17 57	18 44	19 39	20 42
35	6 05	4 40	18 09	18 58	19 55	20 58
30	6 01	4 41	18 19	19 11	20 09	21 11
20	5 54	4 41	18 37	19 33	20 33	21 35
10	5 48	4 38	18 53	19 52	20 53	21 55
0	5 43	4 34	19 08	20 10	21 13	22 14
10	5 37	4 26	19 23	20 28	21 32	22 34
20	5 31	4 17	19 39	20 47	21 53	22 54
30	5 24	4 03	19 58	21 09	22 17	23 18
35	5 20	3 53	20 09	21 22	22 31	23 32
40	5 15	3 41	20 22	21 38	22 47	23 47
45	5 09	3 26	20 36	21 56	23 07	24 06
50	5 02	3 05	20 55	22 18	23 31	24 30
52	4 59	2 55	21 04	22 29	23 43	24 42
54	4 56	2 43	21 13	22 42	23 57	24 55
56	4 52	2 29	21 25	22 56	24 13	0 13
58	4 48	2 12	21 37	23 12	24 31	0 31
60	4 43	1 49	21 52	23 32	24 54	0 54
S						

Lat. °	Sunset h m	Twlt. ends h m	Moonset 13 h m	Moonset 14 h m	Moonset 15 h m	Moonset 16 h m
N 72	16 14	20 04	□	□	□	□
70	16 24	19 51	10 59	□	□	□
68	16 33	19 40	10 17	□	□	□
66	16 40	19 32	9 48	12 06	□	□
64	16 46	19 25	9 27	11 28	13 18	14 30
62	16 51	19 19	9 10	11 01	12 39	13 48
60	16 56	19 15	8 56	10 39	12 11	13 20
58	16 59	19 10	8 43	10 22	11 50	12 58
56	17 03	19 07	8 33	10 08	11 33	12 40
54	17 06	19 04	8 24	9 55	11 18	12 25
52	17 09	19 01	8 16	9 45	11 05	12 12
50	17 12	18 59	8 08	9 35	10 54	12 00
45	17 18	18 55	7 53	9 14	10 30	11 36
40	17 23	18 53	7 40	8 58	10 11	11 17
35	17 27	18 51	7 29	8 44	9 56	11 00
30	17 31	18 51	7 20	8 32	9 42	10 46
20	17 38	18 51	7 04	8 12	9 19	10 23
10	17 44	18 54	6 50	7 54	8 58	10 02
0	17 49	18 58	6 37	7 37	8 40	9 42
10	17 55	19 06	6 24	7 21	8 21	9 23
20	18 02	19 17	6 10	7 03	8 01	9 02
30	18 09	19 31	5 54	6 43	7 38	8 38
35	18 13	19 41	5 45	6 31	7 24	8 24
40	18 18	19 53	5 34	6 17	7 08	8 07
45	18 24	20 10	5 22	6 01	6 50	7 48
50	18 31	20 31	5 07	5 42	6 26	7 23
52	18 34	20 41	5 00	5 32	6 15	7 11
54	18 37	20 53	4 53	5 22	6 03	6 58
56	18 41	21 08	4 44	5 10	5 48	6 42
58	18 46	21 27	4 35	4 57	5 31	6 24
60	18 51	21 51	4 24	4 41	5 11	6 01
S						

GMT h	Equation of Time (App.—Mean) 13 m s	14 m s	15 m s
0	+13 30.4	+13 45.0	+13 59.1
6	+13 34.1	+13 48.6	+14 02.6
12	+13 37.8	+13 52.1	+14 06.0
18	+13 41.4	+13 55.6	+14 09.3
24	+13 45.0	+13 59.1	+14 12.7

GMT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
13	0 23	14 08	18 23	6 36	13 05
14	1 23	14 06	18 22	6 32	13 01
15	2 25	14 04	18 21	6 29	12 58
16	3 28	14 01	18 19	6 25	12 54

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0	0.4	0.4	0.2
30	0.4	0.3	0.1
45	0.4	0.2	0.1
60	0.4	0.1	0.1
75	0.4	0.0	0.0
90			

Moon's Lower Limb Add

Alt. °	13 ′	14 ′	15 ′
0	20.9	20.5	19.9
4	20.9	20.5	19.9
8	20.8	20.5	19.8
12	20.8	20.4	19.8
16	20.7	20.3	19.7
20	20.6	20.2	19.6
24	20.5	20.1	19.5
28	20.3	20.0	19.4
32	20.2	19.8	19.3
36	20.0	19.7	19.2
40	19.8	19.5	19.0
44	19.6	19.3	18.8
48	19.4	19.1	18.7
52	19.2	18.9	18.5
56	18.9	18.7	18.3
60	18.7	18.4	18.1
64	18.4	18.2	17.9
68	18.1	17.9	17.6
72	17.9	17.7	17.4
76	17.6	17.4	17.2
80	17.3	17.2	17.0
84	17.0	16.9	16.7
88	16.8	16.7	16.5
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt. °	13 ′	14 ′	15 ′
0	12.5	12.7	13.1
4	12.5	12.7	13.1
8	12.6	12.8	13.1
12	12.6	12.8	13.2
16	12.7	12.9	13.2
20	12.8	13.0	13.3
24	12.9	13.1	13.4
28	13.1	13.2	13.5
32	13.2	13.4	13.7
36	13.4	13.5	13.8
40	13.6	13.7	13.9
44	13.8	13.9	14.1
48	14.0	14.1	14.3
52	14.2	14.3	14.5
56	14.5	14.5	14.7
60	14.7	14.8	14.9
64	15.0	15.0	15.1
68	15.3	15.3	15.3
72	15.5	15.5	15.5
76	15.8	15.8	15.8
80	16.1	16.1	16.0
84	16.4	16.3	16.2
88	16.6	16.5	16.4
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −4.3 GHA	VENUS Dec.	MARS −0.2 GHA	MARS Dec.	JUPITER −1.8 GHA	JUPITER Dec.	SATURN 0.8 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
16 0	23 58.6	149 23.6	−25 45.9	84 54.6	−23 28.1	263 31.2	+20 40.1	165 58.9	−12 40.5	310 16.1	35	+24 38.0	+ 10
1	39 01.1	164 25.1	46.2	99 55.4	27.7	278 33.4	40.0	181 01.1	40.6	324 38.6	36	24 39.0	+ 9
2	54 03.5	179 26.7	46.6	114 56.2	27.3	293 35.6	40.0	196 03.3	40.7	339 01.2	36	24 39.9	+ 7
3	69 06.0	194 28.3	·· 46.9	129 57.0	·· 26.9	308 37.8	·· 39.9	211 05.5	·· 40.8	353 23.8	36	·24 40.6	+ 5
4	84 08.5	209 29.9	47.2	144 57.8	26.6	323 40.0	39.9	226 07.7	40.9	7 46.4	36	24 41.1	+ 4
5	99 10.9	224 31.5	47.5	159 58.6	26.2	338 42.2	39.8	241 09.8	41.0	22 09.0	37	24 41.5	+ 1
6	114 13.4	239 33.1	−25 47.8	174 59.4	−23 25.8	353 44.4	+20 39.8	256 12.0	−12 41.1	36 31.7	37	+24 41.6	0
7	129 15.9	254 34.7	48.1	190 00.2	25.4	8 46.7	39.8	271 14.2	41.2	50 54.4	38	24 41.6	− 2
8	144 18.3	269 36.3	48.4	205 01.0	25.0	23 48.9	39.7	286 16.4	41.3	65 17.2	39	24 41.4	− 3
9	159 20.8	284 37.9	·· 48.7	220 01.8	·· 24.6	38 51.1	·· 39.7	301 18.6	·· 41.4	79 40.1	38	·24 41.1	− 5
10	174 23.2	299 39.5	49.0	235 02.6	24.3	53 53.3	39.6	316 20.8	41.5	94 02.9	40	24 40.6	− 7
11	189 25.7	314 41.1	49.3	250 03.4	23.9	68 55.5	39.6	331 22.9	41.6	108 25.9	40	24 39.9	− 9
12	204 28.2	329 42.7	−25 49.6	265 04.2	−23 23.5	83 57.7	+20 39.5	346 25.1	−12 41.7	122 48.9	40	+24 39.0	− 11
13	219 30.6	344 44.4	49.9	280 05.0	23.1	98 59.9	39.5	1 27.3	41.8	137 11.9	41	24 37.9	− 12
14	234 33.1	359 46.0	50.1	295 05.8	22.7	114 02.1	39.5	16 29.5	41.9	151 35.0	42	24 36.7	− 13
15	249 35.6	14 47.6	·· 50.4	310 06.6	·· 22.3	129 04.3	·· 39.4	31 31.7	·· 42.0	165 58.2	42	·24 35.4	− 16
16	264 38.0	29 49.2	50.7	325 07.4	22.0	144 06.5	39.4	46 33.8	42.1	180 21.4	43	24 33.8	− 17
17	279 40.5	44 50.9	51.0	340 08.2	21.6	159 08.8	39.3	61 36.0	42.1	194 44.7	44	24 32.1	− 19
18	294 43.0	59 52.5	−25 51.3	355 09.0	−23 21.2	174 11.0	+20 39.3	76 38.2	−12 42.2	209 08.1	44	+24 30.2	− 20
19	309 45.4	74 54.1	51.6	10 09.8	20.8	189 13.2	39.2	91 40.4	42.3	223 31.5	45	24 28.2	− 23
20	324 47.9	89 55.8	51.9	25 10.6	20.4	204 15.4	39.2	106 42.6	42.4	237 55.0	45	24 25.9	− 23
21	339 50.4	104 57.4	·· 52.2	40 11.4	·· 20.0	219 17.6	·· 39.2	121 44.8	·· 42.5	252 18.5	47	·24 23.6	− 26
22	354 52.8	119 59.1	52.4	55 12.2	19.6	234 19.8	39.1	136 46.9	42.6	266 42.2	47	24 21.0	− 27
23	9 55.3	135 00.7	52.7	70 13.0	19.2	249 22.0	39.1	151 49.1	42.7	281 05.9	48	24 18.3	− 28
17 0	24 57.7	150 02.4	−25 53.0	85 13.8	−23 18.9	264 24.2	+20 39.0	166 51.3	−12 42.8	295 29.7	48	+24 15.5	− 30
1	40 00.2	165 04.0	53.3	100 14.6	18.5	279 26.5	39.0	181 53.5	42.9	309 53.5	50	24 12.5	− 32
2	55 02.7	180 05.7	53.5	115 15.4	18.1	294 28.7	38.9	196 55.7	43.0	324 17.5	50	24 09.3	− 34
3	70 05.1	195 07.4	·· 53.8	130 16.1	·· 17.7	309 30.9	·· 38.9	211 57.8	·· 43.1	338 41.5	51	·24 05.9	− 35
4	85 07.6	210 09.0	54.1	145 16.9	17.3	324 33.1	38.9	227 00.0	43.2	353 05.6	52	24 02.4	− 36
5	100 10.1	225 10.7	54.4	160 17.7	16.9	339 35.3	38.8	242 02.2	43.3	7 29.8	53	23 58.8	− 38
6	115 12.5	240 12.4	−25 54.6	175 18.5	−23 16.5	354 37.5	+20 38.8	257 04.4	−12 43.4	21 54.1	53	+23 55.0	− 39
7	130 15.0	255 14.1	54.9	190 19.3	16.1	9 39.7	38.7	272 06.6	43.5	36 18.4	55	23 51.1	− 42
8	145 17.5	270 15.8	55.2	205 20.1	15.7	24 42.0	38.7	287 08.7	43.6	50 42.9	55	23 46.9	− 42
9	160 19.9	285 17.4	·· 55.4	220 20.9	·· 15.3	39 44.2	·· 38.7	302 10.9	·· 43.7	65 07.4	56	·23 42.7	− 44
10	175 22.4	300 19.1	55.7	235 21.7	15.0	54 46.4	38.6	317 13.1	43.8	79 32.0	57	23 38.3	− 45
11	190 24.9	315 20.8	56.0	250 22.5	14.6	69 48.6	38.6	332 15.3	43.9	93 56.7	58	23 33.8	− 47
12	205 27.3	330 22.5	−25 56.2	265 23.3	−23 14.2	84 50.8	+20 38.5	347 17.5	−12 43.9	108 21.5	59	+23 29.1	− 49
13	220 29.8	345 24.2	56.5	280 24.1	13.8	99 53.0	38.5	2 19.6	44.0	122 46.4	60	23 24.2	− 50
14	235 32.2	0 25.9	56.8	295 24.9	13.4	114 55.3	38.4	17 21.8	44.1	137 11.4	61	23 19.2	− 51
15	250 34.7	15 27.6	·· 57.0	310 25.7	·· 13.0	129 57.5	·· 38.4	32 24.0	·· 44.2	151 36.5	62	·23 14.1	− 52
16	265 37.2	30 29.3	57.3	325 26.5	12.6	144 59.7	38.4	47 26.2	44.3	166 01.7	63	23 08.9	− 55
17	280 39.6	45 31.1	57.5	340 27.3	12.2	160 01.9	38.3	62 28.4	44.4	180 27.0	63	23 03.4	− 55
18	295 42.1	60 32.8	−25 57.8	355 28.1	−23 11.8	175 04.1	+20 38.3	77 30.6	−12 44.5	194 52.3	65	+22 57.9	− 57
19	310 44.6	75 34.5	58.0	10 28.9	11.4	190 06.4	38.2	92 32.7	44.6	209 17.8	66	22 52.2	− 58
20	325 47.0	90 36.2	58.3	25 29.6	11.0	205 08.6	38.2	107 34.9	44.7	223 43.4	66	22 46.4	− 59
21	340 49.5	105 37.9	·· 58.5	40 30.4	·· 10.6	220 10.8	·· 38.2	122 37.1	·· 44.8	238 09.0	68	·22 40.5	− 61
22	355 52.0	120 39.7	58.8	55 31.2	10.2	235 13.0	38.1	137 39.3	44.9	252 34.8	69	22 34.4	− 62
23	10 54.4	135 41.4	59.0	70 32.0	09.8	250 15.2	38.1	152 41.5	45.0	267 00.7	70	22 28.2	− 64
18 0	25 56.9	150 43.1	−25 59.3	85 32.8	−23 09.4	265 17.5	+20 38.0	167 43.6	−12 45.1	281 26.7	70	+22 21.8	− 64
1	40 59.4	165 44.9	59.5	100 33.6	09.1	280 19.7	38.0	182 45.8	45.2	295 52.7	72	22 15.4	− 66
2	56 01.8	180 46.6	25 59.8	115 34.4	08.7	295 21.9	37.9	197 48.0	45.3	310 18.9	73	22 08.8	− 67
3	71 04.3	195 48.4	·26 00.0	130 35.2	·· 08.3	310 24.1	·· 37.9	212 50.2	·· 45.4	324 45.2	73	·22 02.1	− 69
4	86 06.7	210 50.1	00.3	145 36.0	07.9	325 26.3	37.9	227 52.4	45.5	339 11.5	75	21 55.2	− 69
5	101 09.2	225 51.9	00.5	160 36.8	07.5	340 28.6	37.8	242 54.5	45.6	353 38.0	76	21 48.3	− 71
6	116 11.7	240 53.6	−26 00.7	175 37.6	−23 07.1	355 30.8	+20 37.8	257 56.7	−12 45.6	8 04.6	77	+21 41.2	− 72
7	131 14.1	255 55.4	01.0	190 38.4	06.7	10 33.0	37.7	272 58.9	45.7	22 31.3	78	21 34.0	− 73
8	146 16.6	270 57.2	01.2	205 39.1	06.3	25 35.2	37.7	288 01.1	45.8	36 58.1	79	21 26.7	− 75
9	161 19.1	285 58.9	·· 01.5	220 39.9	·· 05.9	40 37.4	·· 37.7	303 03.3	·· 45.9	51 25.0	80	·21 19.2	− 75
10	176 21.5	301 00.7	01.7	235 40.7	05.5	55 39.7	37.6	318 05.4	46.0	65 52.0	81	21 11.7	− 77
11	191 24.0	316 02.5	01.9	250 41.5	05.1	70 41.9	37.6	333 07.6	46.1	80 19.1	82	21 04.0	− 78
12	206 26.5	331 04.3	−26 02.1	265 42.3	−23 04.7	85 44.1	+20 37.5	348 09.8	−12 46.2	94 46.3	83	+20 56.2	− 79
13	221 28.9	346 06.1	02.4	280 43.1	04.3	100 46.3	37.5	3 12.0	46.3	109 13.6	+84	20 48.3	− 80
14	236 31.4	1 07.8	02.6	295 43.9	03.9	115 48.6	37.5	18 14.2	46.4	123 41.0	85	20 40.3	− 81
15	251 33.9	16 09.6	·· 02.8	310 44.7	·· 03.5	130 50.8	·· 37.4	33 16.3	·· 46.5	138 08.5	87	·20 32.2	− 82
16	266 36.3	31 11.4	03.1	325 45.5	03.1	145 53.0	37.4	48 18.5	46.6	152 36.2	87	20 24.0	− 83
17	281 38.8	46 13.2	03.3	340 46.3	02.7	160 55.2	37.3	63 20.7	46.7	167 03.9	88	20 15.7	− 84
18	296 41.2	61 15.0	−26 03.5	355 47.0	−23 02.3	175 57.5	+20 37.3	78 22.9	−12 46.8	181 31.7	90	+20 07.3	− 86
19	311 43.7	76 16.8	03.7	10 47.8	01.9	190 59.7	37.3	93 25.1	46.9	195 59.7	90	19 58.7	− 86
20	326 46.2	91 18.6	03.9	25 48.6	01.5	206 01.9	37.2	108 27.2	47.0	210 27.7	92	19 50.1	− 87
21	341 48.6	106 20.4	·· 04.2	40 49.4	·· 01.1	221 04.1	·· 37.2	123 29.4	·· 47.1	224 55.9	92	·19 41.4	− 88
22	356 51.1	121 22.3	04.4	55 50.2	00.7	236 06.4	37.1	138 31.6	47.2	239 24.1	94	19 32.6	− 90
23	11 53.6	136 24.1	04.6	70 51.0	23 00.3	251 08.6	37.1	153 33.8	47.3	253 52.5	94	19 23.6	− 90
24	26 56.0	151 25.9	−26 04.8	85 51.8	−22 59.9	266 10.8	+20 37.1	168 36.0	−12 47.3	268 20.9	96	+19 14.6	− 91
code	—	+ 17	− 3	+ 8	+ 4	+ 22	0	+ 21	− 1				

G M T	SUN GHA	SUN Dec.
h	° ′	° ′
16 0	183 33.2	− 8 36.4
1	198 33.4	37.3
2	213 33.5	38.2
3	228 33.6	·· 39.1
4	243 33.8	40.1
5	258 33.9	41.0
6	273 34.1	− 8 41.9
7	288 34.2	42.8
8	303 34.3	43.7
9	318 34.5	·· 44.7
10	333 34.6	45.6
11	348 34.7	46.5
12	3 34.9	− 8 47.4
13	18 35.0	48.4
14	33 35.1	49.3
15	48 35.3	·· 50.2
16	63 35.4	51.1
17	78 35.5	52.0
18	93 35.7	− 8 53.0
19	108 35.8	53.9
20	123 35.9	54.8
21	138 36.1	·· 55.7
22	153 36.2	56.6
23	168 36.3	57.6
17 0	183 36.5	− 8 58.5
1	198 36.6	8 59.4
2	213 36.7	9 00.3
3	228 36.9	·· 01.2
4	243 37.0	02.2
5	258 37.1	03.1
6	273 37.3	− 9 04.0
7	288 37.4	04.9
8	303 37.5	05.8
9	318 37.6	·· 06.7
10	333 37.8	07.7
11	348 37.9	08.6
12	3 38.0	− 9 09.5
13	18 38.2	10.4
14	33 38.3	11.3
15	48 38.4	·· 12.2
16	63 38.5	13.2
17	78 38.7	14.1
18	93 38.8	− 9 15.0
19	108 38.9	15.9
20	123 39.1	16.8
21	138 39.2	·· 17.7
22	153 39.3	18.6
23	168 39.4	19.6
18 0	183 39.6	− 9 20.5
1	198 39.7	21.4
2	213 39.8	22.3
3	228 39.9	·· 23.2
4	243 40.1	24.1
5	258 40.2	25.0
6	273 40.3	− 9 26.0
7	288 40.4	26.9
8	303 40.6	27.8
9	318 40.7	·· 28.7
10	333 40.8	29.6
11	348 40.9	30.5
12	3 41.0	− 9 31.4
13	18 41.2	32.3
14	33 41.3	33.2
15	48 41.4	·· 34.2
16	63 41.5	35.1
17	78 41.7	36.0
18	93 41.8	− 9 36.9
19	108 41.9	37.8
20	123 42.0	38.7
21	138 42.1	·· 39.6
22	153 42.3	40.5
23	168 42.4	41.4
24	183 42.5	− 9 42.3
code	—	− 9

No.	STARS Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.2	−40 28.8
5	Achernar	335 58.7	−57 27.8
30	Acrux	173 59.4	−62 50.9
19	Adhara	255 47.0	−28 54.3
10	Aldebaran	291 39.6	+16 25.3
32	Alioth	166 59.6	+56 12.2
34	Alkaid	153 33.9	+49 32.3
55	Al Na'ir	28 38.5	−47 10.9
15	Alnilam	276 30.8	− 1 13.6
25	Alphard	218 39.4	− 8 27.6
41	Alphecca	126 48.5	+26 52.0
1	Alpheratz	358 28.8	+28 50.7
51	Altair	62 51.1	+ 8 45.0
2	Ankaa	353 58.5	−42 32.9
42	Antares	113 20.5	−26 20.1
37	Arcturus	146 36.1	+19 25.1
43	Atria	109 02.3	−68 57.1
22	Avior	234 36.2	−59 21.5
13	Bellatrix	279 19.0	+ 6 18.8
16	Betelg'se	271 48.8	+ 7 24.1
17	Canopus	264 15.5	−52 39.9
12	Capella	281 39.2	+45 57.2
53	Deneb	50 01.4	+45 07.4
28	Denebola	183 18.7	+14 49.5
4	Diphda	349 39.6	−18 13.9
27	Dubhe	194 45.9	+61 59.5
14	Elnath	279 08.0	+28 34.3
47	Eltanin	91 06.8	+51 29.9
54	Enif	34 30.1	+ 9 40.3
56	Fomalhaut	16 12.1	−29 51.6
31	Gacrux	172 50.7	−56 51.6
29	Gienah	176 37.9	−17 17.4
35	Hadar	149 51.2	−60 09.4
6	Hamal	328 50.1	+23 15.2
48	Kaus Aust.	84 42.2	−34 24.6
40	Kochab	137 18.9	+74 20.4
57	Markab	14 21.9	+14 58.0
8	Menkar	315 00.8	+ 3 55.0
36	Menkent	148 59.9	−36 08.9
24	Miapl'dus	221 49.7	−69 31.6
9	Mirfak	309 43.0	+49 42.2
50	Nunki	76 52.8	−26 21.3
52	Peacock	54 28.2	−56 53.1
21	Pollux	244 21.4	+28 08.2
20	Procyon	245 45.7	+ 5 20.6
46	R'alhague	96 47.4	+12 35.6
26	Regulus	208 30.4	+12 11.3
11	Rigel	281 54.1	− 8 14.9
38	Rigil Kent.	140 52.7	−60 39.2
44	Sabik	103 03.2	−15 40.2
3	Schedar	350 30.3	+56 17.6
45	Shaula	97 21.9	−37 04.5
18	Sirius	259 12.4	−16 38.9
33	Spica	159 18.0	−10 55.5
23	Suhail	223 25.0	−43 14.7
49	Vega	81 08.9	+38 44.7
39	Zub'g'bi	137 54.5	−15 51.3

Lat.	Sunrise	Twlt begins	Moonrise 16	Moonrise 17	Moonrise 18	Moonrise 19
N °	h m	h m	h m	h m	h m	h m
72	7 31	3 37	□	□	□	20 50
70	7 19	3 49	□	□	□	21 31
68	7 09	3 59	□	□	19 47	21 58
66	7 01	4 06	□	18 18	20 26	22 19
64	6 54	4 12	17 29	19 07	20 53	22 35
62	6 48	4 18	18 11	19 37	21 14	22 49
60	6 43	4 22	18 39	20 00	21 30	23 00
58	6 38	4 25	19 01	20 19	21 44	23 10
56	6 34	4 28	19 19	20 34	21 56	23 19
54	6 31	4 31	19 34	20 48	22 07	23 26
52	6 27	4 34	19 47	20 59	22 16	23 33
50	6 24	4 36	19 58	21 10	22 24	23 39
45	6 18	4 38	20 22	21 31	22 42	23 52
40	6 12	4 41	20 42	21 48	22 56	24 03
35	6 07	4 42	20 58	22 03	23 09	24 12
30	6 03	4 42	21 11	22 16	23 19	24 20
20	5 55	4 41	21 35	22 37	23 37	24 34
10	5 49	4 39	21 55	22 56	23 53	24 46
0	5 42	4 32	22 14	23 13	24 08	0 08
10	5 36	4 25	22 34	23 30	24 22	0 22
20	5 29	4 14	22 54	23 49	24 38	0 38
30	5 20	3 59	23 18	24 10	0 10	0 55
35	5 16	3 48	23 32	24 23	0 23	1 06
40	5 10	3 36	23 47	24 37	0 37	1 17
45	5 04	3 20	24 06	0 06	0 54	1 31
50	4 56	2 57	24 30	0 30	1 15	1 48
52	4 53	2 46	24 42	0 42	1 25	1 56
54	4 49	2 33	24 55	0 55	1 36	2 05
56	4 45	2 17	0 13	1 10	1 48	2 15
58	4 40	1 58	0 31	1 27	2 03	2 26
60	4 34	1 31	0 54	1 49	2 20	2 38
S						

Lat.	Sunset	Twlt. ends	Moonset 16	Moonset 17	Moonset 18	Moonset 19
N °	h m	h m	h m	h m	h m	h m
72	15 58	19 48	□	□	□	17 00
70	16 10	19 36	□	□	□	16 17
68	16 20	19 27	□	□	16 13	15 48
66	16 28	19 20	□	15 46	15 34	15 26
64	16 35	19 14	14 30	14 58	15 06	15 09
62	16 42	19 10	13 48	14 26	14 45	14 54
60	16 47	19 06	13 20	14 03	14 27	14 42
58	16 51	19 02	12 58	13 44	14 13	14 32
56	16 56	19 00	12 40	13 28	14 00	14 22
54	16 59	18 57	12 25	13 14	13 49	14 14
52	17 03	18 55	12 12	13 02	13 39	14 07
50	17 06	18 53	12 00	12 52	13 31	14 00
45	17 13	18 51	11 36	12 30	13 12	13 45
40	17 18	18 48	11 17	12 12	12 57	13 33
35	17 23	18 47	11 00	11 57	12 44	13 23
30	17 28	18 48	10 46	11 43	12 32	13 14
20	17 35	18 49	10 23	11 21	12 13	12 58
10	17 42	18 52	10 02	11 01	11 56	12 45
0	17 49	18 59	9 42	10 43	11 40	12 32
10	17 55	19 06	9 23	10 25	11 23	12 19
20	18 03	19 18	9 02	10 05	11 06	12 05
30	18 11	19 34	8 38	9 42	10 46	11 49
35	18 16	19 45	8 24	9 28	10 34	11 39
40	18 21	19 57	8 07	9 13	10 21	11 29
45	18 28	20 15	7 48	8 54	10 05	11 16
50	18 36	20 38	7 23	8 31	9 45	11 00
52	18 39	20 49	7 11	8 20	9 35	10 53
54	18 43	21 02	6 58	8 07	9 24	10 45
56	18 48	21 19	6 42	7 52	9 12	10 35
58	18 53	21 40	6 24	7 35	8 58	10 25
60	18 58	22 08	6 01	7 14	8 41	10 13
S						

G M T	Equation of Time (App.—Mean) 16	17	18
h	m s	m s	m s
0	+14 12.7	+14 25.6	+14 38.0
6	+14 16.0	+14 28.8	+14 41.0
12	+14 19.2	+14 31.9	+14 43.9
18	+14 22.4	+14 35.0	+14 46.9
24	+14 25.6	+14 38.0	+14 49.7

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
16	3 28	14 01	18 19	6 25	12 54
17	4 29	13 58	18 18	6 21	12 51
18	5 26	13 56	18 17	6 18	12 47
19	6 20	13 53	18 16	6 14	12 44

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.4	0.4	0.2
30			
	0.4	0.3	0.1
45			
	0.4	0.2	0.1
60			
	0.4	0.1	0.1
75			
	0.4	0.1	0.0
90			

Moon's Lower Limb **Add**

Alt.	16	17	18
°	′	′	′
0			
	18.9	17.8	16.8
4			
	18.8	17.8	16.8
8			
	18.8	17.8	16.8
12			
	18.8	17.8	16.8
16			
	18.7	17.8	16.8
20			
	18.7	17.7	16.8
24			
	18.6	17.7	16.7
28			
	18.5	17.6	16.7
32			
	18.4	17.5	16.7
36			
	18.3	17.5	16.6
40			
	18.2	17.4	16.6
44			
	18.1	17.3	16.5
48			
	17.9	17.2	16.5
52			
	17.8	17.1	16.4
56			
	17.6	17.0	16.4
60			
	17.5	16.9	16.3
64			
	17.3	16.8	16.2
68			
	17.1	16.7	16.2
72			
	17.0	16.5	16.1
76			
	16.8	16.4	16.0
80			
	16.6	16.3	16.0
84			
	16.4	16.2	15.9
88			
	16.3	16.1	15.8
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	16	17	18
°	′	′	′
0			
	13.7	14.2	14.8
4			
	13.7	14.3	14.8
8			
	13.7	14.3	14.8
12			
	13.7	14.3	14.9
16			
	13.8	14.3	14.9
20			
	13.8	14.4	14.9
24			
	13.9	14.4	14.9
28			
	14.0	14.5	15.0
32			
	14.1	14.5	15.0
36			
	14.2	14.6	15.0
40			
	14.3	14.7	15.1
44			
	14.5	14.8	15.1
48			
	14.6	14.9	15.2
52			
	14.7	15.0	15.2
56			
	14.9	15.1	15.3
60			
	15.0	15.2	15.4
64			
	15.2	15.3	15.4
68			
	15.4	15.4	15.5
72			
	15.5	15.5	15.5
76			
	15.7	15.7	15.6
80			
	15.9	15.8	15.7
84			
	16.1	15.9	15.8
88			
	16.2	16.0	15.8
90			

Subtract from table, back cover

Last Quarter 18

G M T		♈ GHA	VENUS −4.3 GHA	Dec.	MARS −0.1 GHA	Dec.	JUPITER −1.8 GHA	Dec.	SATURN 0.8 GHA	Dec.	MOON GHA	code	Dec.	code
	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
19	0	26 56.0	151 25.9	−26 04.8	85 51.8	−22 59.9	266 10.8	+20 37.1	168 36.0	−12 47.3	268 20.9	96	+19 14.6	−91
	1	41 58.5	166 27.7	05.0	100 52.6	59.5	281 13.1	37.0	183 38.1	47.4	282 49.5	96	19 05.5	−92
	2	57 01.0	181 29.6	05.2	115 53.4	59.0	296 15.3	37.0	198 40.3	47.5	297 18.1	98	18 56.3	−93
	3	72 03.4	196 31.4	•• 05.4	130 54.1	•• 58.6	311 17.5	•• 36.9	213 42.5	•• 47.6	311 46.9	99	•18 47.0	−94
	4	87 05.9	211 33.2	05.6	145 54.9	58.2	326 19.7	36.9	228 44.7	47.7	326 15.8	99	18 37.6	−94
	5	102 08.3	226 35.1	05.9	160 55.7	57.8	341 22.0	36.9	243 46.8	47.8	340 44.7	101	18 28.2	−96
	6	117 10.8	241 36.9	−26 06.1	175 56.5	−22 57.4	356 24.2	+20 36.8	258 49.0	−12 47.9	355 13.8	102	+18 18.6	−96
	7	132 13.3	256 38.8	06.3	190 57.3	57.0	11 26.4	36.8	273 51.2	48.0	9 43.0	102	18 09.0	−98
	8	147 15.7	271 40.6	06.5	205 58.1	56.6	26 28.7	36.7	288 53.4	48.1	24 12.2	104	17 59.2	−98
	9	162 18.2	286 42.5	•• 06.7	220 58.9	•• 56.2	41 30.9	•• 36.7	303 55.6	•• 48.2	38 41.6	105	•17 49.4	−98
	10	177 20.7	301 44.3	06.9	235 59.7	55.8	56 33.1	36.7	318 57.7	48.3	53 11.1	105	17 39.6	−100
	11	192 23.1	316 46.2	07.1	251 00.4	55.4	71 35.4	36.6	333 59.9	48.4	67 40.6	107	17 29.6	−101
	12	207 25.6	331 48.0	−26 07.3	266 01.2	−22 55.0	86 37.6	+20 36.6	349 02.1	−12 48.5	82 10.3	107	+17 19.5	−101
	13	222 28.1	346 49.9	07.4	281 02.0	54.6	101 39.8	36.5	4 04.3	48.6	96 40.0	109	17 09.4	−102
	14	237 30.5	1 51.8	07.6	296 02.8	54.2	116 42.0	36.5	19 06.5	48.7	111 09.9	109	16 59.2	−103
	15	252 33.0	16 53.7	•• 07.8	311 03.6	•• 53.8	131 44.3	•• 36.5	34 08.6	•• 48.8	125 39.8	111	•16 48.9	−103
	16	267 35.5	31 55.5	08.0	326 04.4	53.4	146 46.5	36.4	49 10.8	48.9	140 09.9	111	16 38.6	−104
	17	282 37.9	46 57.4	08.2	341 05.2	53.0	161 48.7	36.4	64 13.0	49.0	154 40.0	112	16 28.2	−105
	18	297 40.4	61 59.3	−26 08.4	356 05.9	−22 52.5	176 51.0	+20 36.3	79 15.2	−12 49.0	169 10.2	113	+16 17.7	−106
	19	312 42.8	77 01.2	08.6	11 06.7	52.1	191 53.2	36.3	94 17.4	49.1	183 40.5	115	16 07.1	−106
	20	327 45.3	92 03.1	08.8	26 07.5	51.7	206 55.4	36.3	109 19.5	49.2	198 11.0	115	15 56.5	−107
	21	342 47.8	107 05.0	•• 09.0	41 08.3	•• 51.3	221 57.7	•• 36.2	124 21.7	•• 49.3	212 41.5	116	•15 45.8	−108
	22	357 50.2	122 06.9	09.1	56 09.1	50.9	236 59.9	36.2	139 23.9	49.4	227 12.1	116	15 35.0	−108
	23	12 52.7	137 08.8	09.3	71 09.9	50.5	252 02.1	36.2	154 26.1	49.5	241 42.7	118	15 24.2	−109
20	0	27 55.2	152 10.7	−26 09.5	86 10.7	−22 50.1	267 04.4	+20 36.1	169 28.2	−12 49.6	256 13.5	119	+15 13.3	−110
	1	42 57.6	167 12.6	09.7	101 11.4	49.7	282 06.6	36.1	184 30.4	49.7	270 44.4	119	15 02.3	−110
	2	58 00.1	182 14.5	09.9	116 12.2	49.3	297 08.9	36.0	199 32.6	49.8	285 15.3	120	14 51.3	−111
	3	73 02.6	197 16.5	•• 10.0	131 13.0	•• 48.9	312 11.1	•• 36.0	214 34.8	•• 49.9	299 46.3	122	•14 40.2	−111
	4	88 05.0	212 18.4	10.2	146 13.8	48.4	327 13.3	36.0	229 37.0	50.0	314 17.5	122	14 29.1	−112
	5	103 07.5	227 20.3	10.4	161 14.6	48.0	342 15.6	35.9	244 39.1	50.1	328 48.7	123	14 17.9	−112
	6	118 10.0	242 22.2	−26 10.5	176 15.4	−22 47.6	357 17.8	+20 35.9	259 41.3	−12 50.2	343 20.0	123	+14 06.7	−113
	7	133 12.4	257 24.2	10.7	191 16.1	47.2	12 20.0	35.8	274 43.5	50.3	357 51.3	125	13 55.4	−114
	8	148 14.9	272 26.1	10.9	206 16.9	46.8	27 22.3	35.8	289 45.7	50.4	12 22.8	125	13 44.0	−114
	9	163 17.3	287 28.1	•• 11.0	221 17.7	•• 46.4	42 24.5	•• 35.8	304 47.8	•• 50.5	26 54.3	126	•13 32.6	−115
	10	178 19.8	302 30.0	11.2	236 18.5	46.0	57 26.7	35.7	319 50.0	50.6	41 25.9	127	13 21.1	−115
	11	193 22.3	317 32.0	11.4	251 19.3	45.5	72 29.0	35.7	334 52.2	50.7	55 57.6	128	13 09.6	−115
	12	208 24.7	332 33.9	−26 11.5	266 20.1	−22 45.1	87 31.2	+20 35.7	349 54.4	−12 50.7	70 29.4	128	+12 58.1	−116
	13	223 27.2	347 35.9	11.7	281 20.8	44.7	102 33.5	35.6	4 56.6	50.8	85 01.2	130	12 46.5	−117
	14	238 29.7	2 37.8	11.9	296 21.6	44.3	117 35.7	35.6	19 58.7	50.9	99 33.2	129	12 34.8	−117
	15	253 32.1	17 39.8	•• 12.0	311 22.4	•• 43.9	132 37.9	•• 35.5	35 00.9	•• 51.0	114 05.1	131	•12 23.1	−118
	16	268 34.6	32 41.8	12.2	326 23.2	43.5	147 40.2	35.5	50 03.1	51.1	128 37.2	132	12 11.3	−117
	17	283 37.1	47 43.7	12.3	341 24.0	43.1	162 42.4	35.5	65 05.3	51.2	143 09.4	132	11 59.6	−119
	18	298 39.5	62 45.7	−26 12.5	356 24.7	−22 42.6	177 44.7	+20 35.4	80 07.4	−12 51.3	157 41.6	133	+11 47.7	−119
	19	313 42.0	77 47.7	12.6	11 25.5	42.2	192 46.9	35.4	95 09.6	51.4	172 13.9	133	11 35.8	−119
	20	328 44.4	92 49.7	12.8	26 26.3	41.8	207 49.1	35.4	110 11.8	51.5	186 46.2	135	11 23.9	−119
	21	343 46.9	107 51.7	•• 12.9	41 27.1	•• 41.4	222 51.4	•• 35.3	125 14.0	•• 51.6	201 18.7	135	•11 12.0	−120
	22	358 49.4	122 53.6	13.1	56 27.9	41.0	237 53.6	35.3	140 16.2	51.7	215 51.2	135	11 00.0	−121
	23	13 51.8	137 55.6	13.2	71 28.7	40.6	252 55.9	35.2	155 18.3	51.8	230 23.7	137	10 47.9	−120
21	0	28 54.3	152 57.6	−26 13.4	86 29.4	−22 40.1	267 58.1	+20 35.2	170 20.5	−12 51.9	244 56.4	137	+10 35.9	−121
	1	43 56.8	167 59.6	13.5	101 30.2	39.7	283 00.3	35.2	185 22.7	52.0	259 29.1	137	10 23.8	−122
	2	58 59.2	183 01.6	13.6	116 31.0	39.3	298 02.6	35.1	200 24.9	52.1	274 01.8	139	10 11.6	−122
	3	74 01.7	198 03.7	•• 13.8	131 31.8	•• 38.9	313 04.8	•• 35.1	215 27.0	•• 52.2	288 34.7	139	• 9 59.4	−122
	4	89 04.2	213 05.7	13.9	146 32.6	38.5	328 07.1	35.1	230 29.2	52.3	303 07.6	139	9 47.2	−122
	5	104 06.6	228 07.7	14.1	161 33.3	38.0	343 09.3	35.0	245 31.4	52.4	317 40.5	140	9 35.0	−123
	6	119 09.1	243 09.7	−26 14.2	176 34.1	−22 37.6	358 11.6	+20 35.0	260 33.6	−12 52.4	332 13.5	141	+ 9 22.7	−123
	7	134 11.6	258 11.7	14.3	191 34.9	37.2	13 13.8	34.9	275 35.8	52.5	346 46.6	141	9 10.4	−123
	8	149 14.0	273 13.8	14.5	206 35.7	36.8	28 16.1	34.9	290 37.9	52.6	1 19.7	142	8 58.1	−124
	9	164 16.5	288 15.8	•• 14.6	221 36.5	•• 36.4	43 18.3	•• 34.9	305 40.1	•• 52.7	15 52.9	143	• 8 45.7	−124
	10	179 18.9	303 17.8	14.7	236 37.2	35.9	58 20.5	34.8	320 42.3	52.8	30 26.2	143	8 33.3	−124
	11	194 21.4	318 19.9	14.8	251 38.0	35.5	73 22.8	34.8	335 44.5	52.9	44 59.5	143	8 20.9	−124
	12	209 23.9	333 21.9	−26 15.0	266 38.8	−22 35.1	88 25.0	+20 34.8	350 46.6	−12 53.0	59 32.8	144	+ 8 08.5	−125
	13	224 26.3	348 24.0	15.1	281 39.6	34.7	103 27.3	34.7	5 48.8	53.1	74 06.2	145	7 56.0	−124
	14	239 28.8	3 26.0	15.2	296 40.4	34.2	118 29.5	34.7	20 51.0	53.2	88 39.7	145	7 43.6	−125
	15	254 31.3	18 28.1	•• 15.3	311 41.1	•• 33.8	133 31.8	•• 34.7	35 53.2	•• 53.3	103 13.2	146	• 7 31.1	−126
	16	269 33.7	33 30.1	15.5	326 41.9	33.4	148 34.0	34.6	50 55.3	53.4	117 46.8	146	7 18.5	−125
	17	284 36.2	48 32.2	15.6	341 42.7	33.0	163 36.3	34.6	65 57.5	53.5	132 20.4	147	7 06.0	−126
	18	299 38.7	63 34.3	−26 15.7	356 43.5	−22 32.6	178 38.5	+20 34.5	80 59.7	−12 53.6	146 54.1	147	+ 6 53.4	−126
	19	314 41.1	78 36.3	15.8	11 44.3	32.1	193 40.8	34.5	96 01.9	53.7	161 27.8	147	6 40.8	−126
	20	329 43.6	93 38.4	15.9	26 45.0	31.7	208 43.0	34.5	111 04.1	53.8	176 01.5	148	6 28.2	−126
	21	344 46.1	108 40.5	•• 16.0	41 45.8	•• 31.3	223 45.3	•• 34.4	126 06.2	•• 53.9	190 35.3	149	• 6 15.6	−126
	22	359 48.5	123 42.6	16.1	56 46.6	30.9	238 47.5	34.4	141 08.4	54.0	205 09.2	149	6 03.0	−127
	23	14 51.0	138 44.7	16.2	71 47.4	30.4	253 49.8	34.4	156 10.6	54.1	219 43.1	149	5 50.3	−127
	24	29 53.4	153 46.8	−26 16.4	86 48.1	−22 30.0	268 52.0	+20 34.3	171 12.8	−12 54.1	234 17.0	150	+ 5 37.6	−126
code		–	+ 20	− 2	+ 7	+ 4	+ 23	− 1	+ 22	− 1				

GMT	SUN GHA	SUN Dec.
19 h 0	183 42.5	− 9 42.3
1	198 42.6	43.2
2	213 42.7	44.2
3	228 42.8 ••	45.1
4	243 43.0	46.0
5	258 43.1	46.9
6	273 43.2	− 9 47.8
7	288 43.3	48.7
8	303 43.4	49.6
9	318 43.6 ••	50.5
10	333 43.7	51.4
11	348 43.8	52.3
12	3 43.9	− 9 53.2
13	18 44.0	54.1
14	33 44.1	55.0
15	48 44.2 ••	55.9
16	63 44.4	56.8
17	78 44.5	57.7
18	93 44.6	− 9 58.6
19	108 44.7	9 59.5
20	123 44.8	10 00.4
21	138 44.9 ••	01.4
22	153 45.0	02.3
23	168 45.2	03.2
20 0	183 45.3	−10 04.1
1	198 45.4	05.0
2	213 45.5	05.9
3	228 45.6 ••	06.8
4	243 45.7	07.7
5	258 45.8	08.6
6	273 45.9	−10 09.5
7	288 46.0	10.4
8	303 46.2	11.3
9	318 46.3 ••	12.2
10	333 46.4	13.1
11	348 46.5	14.0
12	3 46.6	−10 14.9
13	18 46.7	15.8
14	33 46.8	16.7
15	48 46.9 ••	17.6
16	63 47.0	18.5
17	78 47.1	19.4
18	93 47.2	−10 20.3
19	108 47.3	21.2
20	123 47.5	22.1
21	138 47.6 ••	22.9
22	153 47.7	23.8
23	168 47.8	24.7
21 0	183 47.9	−10 25.6
1	198 48.0	26.5
2	213 48.1	27.4
3	228 48.2 ••	28.3
4	243 48.3	29.2
5	258 48.4	30.1
6	273 48.5	−10 31.0
7	288 48.6	31.9
8	303 48.7	32.8
9	318 48.8 ••	33.7
10	333 48.9	34.6
11	348 49.0	35.5
12	3 49.1	−10 36.4
13	18 49.2	37.3
14	33 49.3	38.2
15	48 49.4 ••	39.0
16	63 49.5	39.9
17	78 49.6	40.8
18	93 49.7	−10 41.7
19	108 49.8	42.6
20	123 49.9	43.5
21	138 50.0 ••	44.4
22	153 50.1	45.3
23	168 50.2	46.2
24	183 50.3	−10 47.1
code	—	9

No.	Name	SHA	Dec.
7	Acamar	315 51.2	−40 28.8
5	Achernar	335 58.7	−57 27.8
30	Acrux	173 59.4	−62 50.9
19	Adhara	255 47.0	−28 54.3
10	Aldebaran	291 39.6	+16 25.3
32	Alioth	166 59.6	+56 12.2
34	Alkaid	153 33.9	+49 32.3
55	Al Na'ir	28 38.5	−47 10.9
15	Alnilam	276 30.8	− 1 13.6
25	Alphard	218 39.4	− 8 27.6
41	Alphecca	126 48.5	+26 52.0
1	Alpheratz	358 28.8	+28 50.7
51	Altair	62 51.1	+ 8 45.0
2	Ankaa	353 58.5	−42 33.0
42	Antares	113 20.5	−26 20.1
37	Arcturus	146 36.1	+19 25.0
43	Atria	109 02.3	−68 57.1
22	Avior	234 36.2	−59 21.5
13	Bellatrix	279 19.0	+ 6 18.8
16	Betelg'se	271 48.7	+ 7 24.1
17	Canopus	264 15.5	−52 39.9
12	Capella	281 39.2	+45 57.2
53	Deneb	50 01.4	+45 07.4
28	Denebola	183 18.7	+14 49.5
4	Diphda	349 39.6	−18 13.9
27	Dubhe	194 45.8	+61 59.5
14	Elnath	279 08.0	+28 34.3
47	Eltanin	91 06.8	+51 29.9
54	Enif	34 30.1	+ 9 40.3
56	Fomalhaut	16 12.1	−29 51.7
31	Gacrux	172 50.7	−56 51.6
29	Gienah	176 37.9	−17 17.4
35	Hadar	149 51.1	−60 09.4
6	Hamal	328 50.1	+23 15.2
48	Kaus Aust.	84 42.3	−34 24.6
40	Kochab	137 18.9	+74 20.4
57	Markab	14 21.9	+14 58.0
8	Menkar	315 00.7	+ 3 55.0
36	Menkent	148 59.9	−36 08.9
24	Miapl'dus	221 49.6	−69 31.6
9	Mirfak	309 43.0	+49 42.2
50	Nunki	76 52.9	−26 21.3
52	Peacock	54 28.3	−56 53.1
21	Pollux	244 21.4	+28 08.2
20	Procyon	245 45.7	+ 5 20.6
46	R'alhague	96 47.5	+12 35.6
26	Regulus	208 30.4	+12 11.3
11	Rigel	281 54.1	− 8 14.9
38	Rigil Kent.	140 52.7	−60 39.1
44	Sabik	103 03.2	−15 40.2
3	Schedar	350 30.3	+56 17.7
45	Shaula	97 21.9	−37 04.5
18	Sirius	259 12.4	−16 38.9
33	Spica	159 18.0	−10 55.5
23	Suhail	223 25.0	−43 14.7
49	Vega	81 08.9	+38 44.7
39	Zub'g'bi	137 54.5	−15 51.3

Lat.	Sunrise	Twlt. begins	Moonrise 19	Moonrise 20	Moonrise 21	Moonrise 22
N °	h m	h m	h m	h m	h m	h m
72	7 47	3 51	20 50	23 18	25 20	1 20
70	7 32	4 01	21 31	23 37	25 27	1 27
68	7 21	4 09	21 58	23 51	25 34	1 34
66	7 11	4 16	22 19	24 02	0 02	1 39
64	7 03	4 21	22 35	24 12	0 12	1 43
62	6 56	4 26	22 49	24 20	0 20	1 47
60	6 50	4 29	23 00	24 27	0 27	1 50
58	6 45	4 32	23 10	24 33	0 33	1 53
56	6 41	4 34	23 19	24 39	0 39	1 56
54	6 36	4 36	23 26	24 44	0 44	1 58
52	6 33	4 39	23 33	24 48	0 48	2 00
50	6 29	4 39	23 39	24 52	0 52	2 02
45	6 21	4 42	23 52	25 01	1 01	2 06
40	6 15	4 44	24 03	0 03	1 08	2 10
35	6 10	4 45	24 12	0 12	1 14	2 13
30	6 05	4 44	24 20	0 20	1 19	2 15
20	5 56	4 42	24 34	0 34	1 28	2 20
10	5 49	4 39	24 46	0 46	1 36	2 24
0	5 42	4 32	0 08	0 58	1 44	2 28
10	5 34	4 24	0 22	1 09	1 51	2 31
20	5 26	4 11	0 38	1 21	1 59	2 35
30	5 17	3 55	0 55	1 34	2 09	2 40
35	5 12	3 44	1 06	1 42	2 14	2 42
40	5 06	3 30	1 17	1 51	2 20	2 45
45	4 59	3 12	1 31	2 01	2 26	2 49
50	4 50	2 49	1 48	2 14	2 35	2 53
52	4 46	2 36	1 56	2 20	2 38	2 54
54	4 42	2 22	2 05	2 26	2 43	2 56
56	4 37	2 05	2 15	2 33	2 47	2 59
58	4 32	1 42	2 26	2 41	2 52	3 01
60	4 26	1 10	2 38	2 50	2 58	3 04
S						

Lat.	Sunset	Twlt. ends	Moonset 19	Moonset 20	Moonset 21	Moonset 22
N °	h m	h m	h m	h m	h m	h m
72	15 41	19 32	17 00	16 10	15 41	15 17
70	15 56	19 23	16 17	15 50	15 31	15 14
68	16 07	19 15	15 48	15 34	15 22	15 12
66	16 17	19 09	15 26	15 20	15 15	15 10
64	16 25	19 04	15 09	15 09	15 09	15 08
62	16 32	19 00	14 54	15 00	15 04	15 06
60	16 38	18 57	14 42	14 52	14 59	15 05
58	16 44	18 55	14 32	14 45	14 55	15 03
56	16 48	18 52	14 22	14 38	14 51	15 02
54	16 53	18 51	14 14	14 33	14 48	15 01
52	16 56	18 48	14 07	14 28	14 45	15 00
50	17 00	18 48	14 00	14 23	14 42	15 00
45	17 08	18 46	13 45	14 13	14 37	14 58
40	17 14	18 44	13 33	14 04	14 32	14 56
35	17 20	18 44	13 23	13 57	14 27	14 55
30	17 25	18 45	13 14	13 51	14 23	14 54
20	17 33	18 47	12 58	13 39	14 17	14 52
10	17 41	18 52	12 45	13 29	14 11	14 50
0	17 48	18 58	12 32	13 20	14 05	14 48
10	17 56	19 07	12 19	13 11	13 59	14 46
20	18 04	19 20	12 05	13 00	13 53	14 44
30	18 13	19 37	11 49	12 49	13 46	14 42
35	18 18	19 48	11 39	12 42	13 42	14 41
40	18 25	20 02	11 29	12 34	13 38	14 39
45	18 32	20 20	11 16	12 25	13 32	14 37
50	18 40	20 44	11 00	12 14	13 26	14 35
52	18 45	20 58	10 53	12 09	13 23	14 34
54	18 49	21 12	10 45	12 03	13 20	14 33
56	18 54	21 31	10 35	11 57	13 16	14 32
58	19 00	21 55	10 25	11 50	13 12	14 31
60	19 06	22 30	10 13	11 42	13 07	14 29
S						

Equation of Time (App.—Mean)

GMT	19	20	21
h	m s	m s	m s
0	+14 49.7	+15 00.8	+15 11.3
6	+14 52.6	+15 03.5	+15 13.8
12	+14 55.4	+15 06.2	+15 16.3
18	+14 58.1	+15 08.7	+15 18.7
24	+15 00.8	+15 11.3	+15 21.1

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
19	6 20	13 53	18 16	6 14	12 44
20	7 09	13 50	18 14	6 11	12 40
21	7 55	13 46	18 13	6 07	12 37
22	8 38	13 43	18 12	6 04	12 33

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.4	0.4	0.2
30			
	0.4	0.3	0.1
45			
	0.4	0.2	0.1
60			
	0.4	0.2	0.1
75			
	0.4	0.1	0.0
90			

Moon's Lower Limb Add

Alt.	19	20	21
°	′	′	′
0			
	15.7	14.8	14.0
4			
	15.7	14.8	14.0
8			
	15.7	14.8	14.0
12			
	15.7	14.8	14.1
16			
	15.7	14.8	14.1
20			
	15.7	14.8	14.1
24			
	15.7	14.8	14.1
28			
	15.7	14.9	14.2
32			
	15.7	14.9	14.2
36			
	15.7	14.9	14.3
40			
	15.7	14.9	14.3
44			
	15.6	15.0	14.4
48			
	15.6	15.0	14.5
52			
	15.6	15.0	14.5
56			
	15.6	15.1	14.6
60			
	15.6	15.1	14.7
64			
	15.6	15.1	14.7
68			
	15.6	15.2	14.8
72			
	15.6	15.2	14.9
76			
	15.6	15.3	15.0
80			
	15.6	15.3	15.1
84			
	15.6	15.3	15.1
88			
	15.6	15.4	15.2
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	19	20	21
°	′	′	′
0			
	15.5	16.0	16.4
4			
	15.5	16.0	16.4
8			
	15.5	16.0	16.4
12			
	15.5	16.0	16.4
16			
	15.5	16.0	16.4
20			
	15.5	15.9	16.3
24			
	15.5	15.9	16.3
28			
	15.5	15.9	16.3
32			
	15.5	15.9	16.2
36			
	15.5	15.9	16.2
40			
	15.5	15.8	16.1
44			
	15.5	15.8	16.1
48			
	15.5	15.8	16.0
52			
	15.5	15.7	15.9
56			
	15.5	15.7	15.9
60			
	15.5	15.7	15.8
64			
	15.5	15.6	15.7
68			
	15.5	15.6	15.6
72			
	15.6	15.6	15.6
76			
	15.6	15.5	15.5
80			
	15.6	15.5	15.4
84			
	15.6	15.4	15.3
88			
	15.6	15.4	15.2
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −4.2 GHA	VENUS Dec.	MARS −0.1 GHA	MARS Dec.	JUPITER −1.8 GHA	JUPITER Dec.	SATURN 0.8 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
22 0	29 53.4	153 46.8	−26 16.4	86 48.1	−22 30.0	268 52.0	+20 34.3	171 12.8	−12 54.1	234 17.0	150	+ 5 37.6	−126
1	44 55.9	168 48.9	16.5	101 48.9	29.6	283 54.3	34.3	186 14.9	54.2	248 51.0	150	5 25.0	−127
2	59 58.4	183 51.0	16.6	116 49.7	29.2	298 56.5	34.3	201 17.1	54.3	263 25.0	150	5 12.3	−127
3	75 00.8	198 53.1	·· 16.7	131 50.5	·· 28.7	313 58.8	·· 34.2	216 19.3	·· 54.4	277 59.0	151	· 4 59.6	−128
4	90 03.3	213 55.2	16.8	146 51.3	28.3	329 01.0	34.2	231 21.5	54.5	292 33.1	152	4 46.8	−127
5	105 05.8	228 57.3	16.9	161 52.0	27.9	344 03.3	34.2	246 23.6	54.6	307 07.3	151	4 34.1	−127
6	120 08.2	243 59.4	−26 17.0	176 52.8	−22 27.4	359 05.5	+20 34.1	261 25.8	−12 54.7	321 41.4	152	+ 4 21.4	−128
7	135 10.7	259 01.5	17.1	191 53.6	27.0	14 07.8	34.1	276 28.0	54.8	336 15.6	152	4 08.6	−127
8	150 13.2	274 03.6	17.1	206 54.4	26.6	29 10.0	34.0	291 30.2	54.9	350 49.8	153	3 55.9	−128
9	165 15.6	289 05.8	·· 17.2	221 55.1	·· 26.2	44 12.3	·· 34.0	306 32.4	·· 55.0	5 24.1	153	· 3 43.1	−127
10	180 18.1	304 07.9	17.3	236 55.9	25.7	59 14.5	34.0	321 34.5	55.1	19 58.4	153	3 30.4	−128
11	195 20.5	319 10.0	17.4	251 56.7	25.3	74 16.8	33.9	336 36.7	55.2	34 32.7	154	3 17.6	−128
12	210 23.0	334 12.2	−26 17.5	266 57.5	−22 24.9	89 19.0	+20 33.9	351 38.9	−12 55.3	49 07.1	154	+ 3 04.8	−128
13	225 25.5	349 14.3	17.6	281 58.2	24.4	104 21.3	33.9	6 41.1	55.4	63 41.5	154	2 52.0	−127
14	240 27.9	4 16.4	17.7	296 59.0	24.0	119 23.5	33.8	21 43.2	55.5	78 15.9	155	2 39.3	−128
15	255 30.4	19 18.6	·· 17.8	311 59.8	·· 23.6	134 25.8	·· 33.8	36 45.4	·· 55.6	92 50.4	154	· 2 26.5	−128
16	270 32.9	34 20.8	17.8	327 00.6	23.1	149 28.0	33.8	51 47.6	55.7	107 24.8	155	2 13.7	−128
17	285 35.3	49 22.9	17.9	342 01.4	22.7	164 30.3	33.7	66 49.8	55.7	121 59.3	156	2 00.9	−128
18	300 37.8	64 25.1	−26 18.0	357 02.1	−22 22.3	179 32.6	+20 33.7	81 51.9	−12 55.8	136 33.9	155	+ 1 48.1	−128
19	315 40.3	79 27.2	18.1	12 02.9	21.9	194 34.8	33.7	96 54.1	55.9	151 08.4	156	1 35.3	−128
20	330 42.7	94 29.4	18.2	27 03.7	21.4	209 37.1	33.6	111 56.3	56.0	165 43.0	156	1 22.5	−127
21	345 45.2	109 31.6	·· 18.2	42 04.5	·· 21.0	224 39.3	·· 33.6	126 58.5	·· 56.1	180 17.6	156	· 1 09.8	−128
22	0 47.7	124 33.8	18.3	57 05.2	20.6	239 41.6	33.6	142 00.6	56.2	194 52.2	156	0 57.0	−128
23	15 50.1	139 35.9	18.4	72 06.0	20.1	254 43.8	33.5	157 02.8	56.3	209 26.8	157	0 44.2	−127
23 0	30 52.6	154 38.1	−26 18.4	87 06.8	−22 19.7	269 46.1	+20 33.5	172 05.0	−12 56.4	224 01.5	156	+ 0 31.5	−128
1	45 55.0	169 40.3	18.5	102 07.6	19.3	284 48.3	33.5	187 07.2	56.5	238 36.1	157	0 18.7	−128
2	60 57.5	184 42.5	18.6	117 08.3	18.8	299 50.6	33.4	202 09.3	56.6	253 10.8	157	+ 0 05.9	−127
3	76 00.0	199 44.7	·· 18.6	132 09.1	·· 18.4	314 52.9	·· 33.4	217 11.5	·· 56.7	267 45.5	157	− 0 06.8	−128
4	91 02.4	214 46.9	18.7	147 09.9	18.0	329 55.1	33.3	232 13.7	56.8	282 20.2	158	0 19.6	−127
5	106 04.9	229 49.1	18.8	162 10.7	17.5	344 57.4	33.3	247 15.9	56.9	296 55.0	157	0 32.3	−127
6	121 07.4	244 51.3	−26 18.8	177 11.4	−22 17.1	359 59.6	+20 33.3	262 18.0	−12 57.0	311 29.7	158	− 0 45.0	−127
7	136 09.8	259 53.5	18.9	192 12.2	16.6	15 01.9	33.2	277 20.2	57.1	326 04.5	157	0 57.7	−127
8	151 12.3	274 55.8	18.9	207 13.0	16.2	30 04.2	33.2	292 22.4	57.2	340 39.2	158	1 10.4	−127
9	166 14.8	289 58.0	·· 19.0	222 13.7	·· 15.8	45 06.4	·· 33.2	307 24.6	·· 57.3	355 14.0	158	· 1 23.1	−127
10	181 17.2	305 00.2	19.0	237 14.5	15.3	60 08.7	33.1	322 26.8	57.4	9 48.8	158	1 35.8	−127
11	196 19.7	320 02.4	19.1	252 15.3	14.9	75 10.9	33.1	337 28.9	57.4	24 23.6	158	1 48.5	−126
12	211 22.1	335 04.7	−26 19.1	267 16.1	−22 14.5	90 13.2	+20 33.1	352 31.1	−12 57.5	38 58.4	158	− 2 01.1	−127
13	226 24.6	350 06.9	19.2	282 16.8	14.0	105 15.5	33.0	7 33.3	57.6	53 33.2	158	2 13.8	−126
14	241 27.1	5 09.2	19.2	297 17.6	13.6	120 17.7	33.0	22 35.5	57.7	68 08.0	158	2 26.4	−126
15	256 29.5	20 11.4	·· 19.3	312 18.4	·· 13.2	135 20.0	·· 33.0	37 37.6	·· 57.8	82 42.8	159	· 2 39.0	−126
16	271 32.0	35 13.7	19.3	327 19.2	12.7	150 22.2	32.9	52 39.8	57.9	97 17.7	158	2 51.6	−125
17	286 34.5	50 15.9	19.4	342 19.9	12.3	165 24.5	32.9	67 42.0	58.0	111 52.5	158	3 04.1	−126
18	301 36.9	65 18.2	−26 19.4	357 20.7	−22 11.8	180 26.8	+20 32.9	82 44.2	−12 58.1	126 27.3	159	− 3 16.7	−125
19	316 39.4	80 20.4	19.4	12 21.5	11.4	195 29.0	32.8	97 46.3	58.2	141 02.2	158	3 29.2	−125
20	331 41.9	95 22.7	19.5	27 22.3	11.0	210 31.3	32.8	112 48.5	58.3	155 37.0	158	3 41.7	−125
21	346 44.3	110 25.0	·· 19.5	42 23.0	·· 10.5	225 33.6	·· 32.8	127 50.7	·· 58.4	170 11.8	158	· 3 54.2	−125
22	1 46.8	125 27.2	19.5	57 23.8	10.1	240 35.8	32.7	142 52.9	58.5	184 46.6	159	4 06.7	−125
23	16 49.3	140 29.5	19.6	72 24.6	09.6	255 38.1	32.7	157 55.0	58.6	199 21.5	158	4 19.2	−124
24 0	31 51.7	155 31.8	−26 19.6	87 25.3	−22 09.2	270 40.4	+20 32.7	172 57.2	−12 58.7	213 56.3	158	− 4 31.6	−124
1	46 54.2	170 34.1	19.6	102 26.1	08.8	285 42.6	32.6	187 59.4	58.8	228 31.1	158	4 44.0	−124
2	61 56.6	185 36.4	19.7	117 26.9	08.3	300 44.9	32.6	203 01.6	58.9	243 05.9	158	4 56.4	−123
3	76 59.1	200 38.7	·· 19.7	132 27.7	·· 07.9	315 47.1	·· 32.6	218 03.7	·· 59.0	257 40.7	159	· 5 08.7	−124
4	92 01.6	215 41.0	19.7	147 28.4	07.4	330 49.4	32.5	233 05.9	59.0	272 15.6	158	5 21.1	−123
5	107 04.0	230 43.3	19.7	162 29.2	07.0	345 51.7	32.5	248 08.1	59.1	286 50.4	157	5 33.4	−122
6	122 06.5	245 45.6	−26 19.8	177 30.0	−22 06.6	0 53.9	+20 32.5	263 10.3	−12 59.2	301 25.1	158	− 5 45.6	−123
7	137 09.0	260 47.9	19.8	192 30.7	06.1	15 56.2	32.4	278 12.4	59.3	315 59.9	158	5 57.9	−122
8	152 11.4	275 50.2	19.8	207 31.5	05.7	30 58.5	32.4	293 14.6	59.4	330 34.7	158	6 10.1	−122
9	167 13.9	290 52.5	·· 19.8	222 32.3	·· 05.2	46 00.7	·· 32.4	308 16.8	·· 59.5	345 09.5	157	· 6 22.3	−122
10	182 16.4	305 54.9	19.8	237 33.1	04.8	61 03.0	32.4	323 19.0	59.6	359 44.2	158	6 34.5	−121
11	197 18.8	320 57.2	19.8	252 33.8	04.3	76 05.3	32.3	338 21.1	59.7	14 19.0	157	6 46.6	−121
12	212 21.3	335 59.5	−26 19.8	267 34.6	−22 03.9	91 07.5	+20 32.3	353 23.3	−12 59.8	28 53.7	157	− 6 58.7	−121
13	227 23.7	351 01.9	19.8	282 35.4	03.4	106 09.8	32.3	8 25.5	12 59.9	43 28.4	157	7 10.8	−120
14	242 26.2	6 04.2	19.8	297 36.1	03.0	121 12.1	32.2	23 27.7	13 00.0	58 03.1	157	7 22.8	−120
15	257 28.7	21 06.5	·· 19.8	312 36.9	·· 02.6	136 14.4	·· 32.2	38 29.8	·· 00.1	72 37.8	156	· 7 34.8	−120
16	272 31.1	36 08.9	19.9	327 37.7	02.1	151 16.6	32.2	53 32.0	00.2	87 12.4	157	7 46.8	−119
17	287 33.6	51 11.2	19.9	342 38.5	01.7	166 18.9	32.1	68 34.2	00.3	101 47.1	156	7 58.7	−119
18	302 36.1	66 13.6	−26 19.9	357 39.2	−22 01.2	181 21.2	+20 32.1	83 36.4	−13 00.4	116 21.7	157	− 8 10.6	−119
19	317 38.5	81 16.0	19.9	12 40.0	00.8	196 23.4	32.1	98 38.5	00.5	130 56.4	156	8 22.5	−118
20	332 41.0	96 18.3	19.8	27 40.8	22 00.3	211 25.7	32.0	113 40.7	00.6	145 31.0	155	8 34.3	−118
21	347 43.5	111 20.7	·· 19.8	42 41.5	·21 59.9	226 28.0	·· 32.0	128 42.9	·· 00.6	160 05.5	156	· 8 46.1	−117
22	2 45.9	126 23.1	19.8	57 42.3	59.4	241 30.3	32.0	143 45.1	00.7	174 40.1	155	8 57.8	−117
23	17 48.4	141 25.5	19.8	72 43.1	59.0	256 32.5	31.9	158 47.2	00.8	189 14.6	156	9 09.5	−117
24	32 50.9	156 27.8	−26 19.8	87 43.8	−21 58.5	271 34.8	+20 31.9	173 49.4	−13 00.9	203 49.2	154	− 9 21.2	−116
code	—	+ 22	− 1	+ 7	+ 5	+ 23	− 1	+ 22	− 1				

GMT		SUN GHA	SUN Dec.
	h	° ′	° ′
22	0	183 50.3	−10 47.1
	1	198 50.4	48.0
	2	213 50.5	48.8
	3	228 50.6	•• 49.7
	4	243 50.7	50.6
	5	258 50.8	51.5
	6	273 50.9	−10 52.4
	7	288 51.0	53.3
	8	303 51.1	54.2
	9	318 51.2	•• 55.1
	10	333 51.3	55.9
	11	348 51.4	56.8
	12	3 51.5	−10 57.7
	13	18 51.6	58.6
	14	33 51.7	10 59.5
	15	48 51.8	· 11 00.4
	16	63 51.9	01.3
	17	78 52.0	02.1
	18	93 52.0	−11 03.0
	19	108 52.1	03.9
	20	123 52.2	04.8
	21	138 52.3	•• 05.7
	22	153 52.4	06.6
	23	168 52.5	07.4
23	0	183 52.6	−11 08.3
	1	198 52.7	09.2
	2	213 52.8	10.1
	3	228 52.9	•• 11.0
	4	243 53.0	11.9
	5	258 53.1	12.7
	6	273 53.1	−11 13.6
	7	288 53.2	14.5
	8	303 53.3	15.4
	9	318 53.4	•• 16.3
	10	333 53.5	17.1
	11	348 53.6	18.0
	12	3 53.7	−11 18.9
	13	18 53.8	19.8
	14	33 53.8	20.7
	15	48 53.9	•• 21.5
	16	63 54.0	22.4
	17	78 54.1	23.3
	18	93 54.2	−11 24.2
	19	108 54.3	25.0
	20	123 54.4	25.9
	21	138 54.5	•• 26.8
	22	153 54.5	27.7
	23	168 54.6	28.6
24	0	183 54.7	−11 29.4
	1	198 54.8	30.3
	2	213 54.9	31.2
	3	228 55.0	•• 32.1
	4	243 55.0	32.9
	5	258 55.1	33.8
	6	273 55.2	−11 34.7
	7	288 55.3	35.6
	8	303 55.4	36.4
	9	318 55.4	•• 37.3
	10	333 55.5	38.2
	11	348 55.6	39.0
	12	3 55.7	−11 39.9
	13	18 55.8	40.8
	14	33 55.8	41.7
	15	48 55.9	•• 42.5
	16	63 56.0	43.4
	17	78 56.1	44.3
	18	93 56.2	−11 45.1
	19	108 56.2	46.0
	20	123 56.3	46.9
	21	138 56.4	•• 47.7
	22	153 56.5	48.6
	23	168 56.6	49.5
24		183 56.6	−11 50.4
code		—	− 9

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.2	−40 28.9
5	Achernar	335 58.7	−57 27.8
30	Acrux	173 59.3	−62 50.9
19	Adhara	255 47.0	−28 54.3
10	Aldebaran	291 39.6	+16 25.3
32	Alioth	166 59.6	+56 12.2
34	Alkaid	153 33.9	+49 32.2
55	Al Na'ir	28 38.5	−47 10.9
15	Alnilam	276 30.8	− 1 13.6
25	Alphard	218 39.4	− 8 27.6
41	Alphecca	126 48.5	+26 52.0
1	Alpheratz	358 28.8	+28 50.7
51	Altair	62 51.1	+ 8 45.0
2	Ankaa	353 58.5	−42 33.0
42	Antares	113 20.5	−26 20.1
37	Arcturus	146 36.1	+19 25.0
43	Atria	109 02.3	−68 57.1
22	Avior	234 36.2	−59 21.5
13	Bellatrix	279 19.0	+ 6 18.8
16	Betelg'se	271 48.7	+ 7 24.1
17	Canopus	264 15.5	−52 39.9
12	Capella	281 39.1	+45 57.2
53	Deneb	50 01.4	+45 07.4
28	Denebola	183 18.7	+14 49.5
4	Diphda	349 39.6	−18 13.9
27	Dubhe	194 45.8	+61 59.5
14	Elnath	279 08.0	+28 34.3
47	Eltanin	91 06.9	+51 29.9
54	Enif	34 30.2	+ 9 40.3
56	Fomalhaut	16 12.1	−29 51.7
31	Gacrux	172 50.6	−56 51.5
29	Gienah	176 37.9	−17 17.4
35	Hadar	149 51.1	−60 09.4
6	Hamal	328 50.1	+23 15.2
48	Kaus Aust.	84 42.3	−34 24.6
40	Kochab	137 18.9	+74 20.4
57	Markab	14 21.9	+14 58.0
8	Menkar	315 00.7	+ 3 55.0
36	Menkent	148 59.9	−36 08.9
24	Miapl'dus	221 49.6	−69 31.6
9	Mirfak	309 43.0	+49 42.2
50	Nunki	76 52.9	−26 21.3
52	Peacock	54 28.3	−56 53.1
21	Pollux	244 21.4	+28 08.2
20	Procyon	245 45.7	+ 5 20.6
46	R'alhague	96 47.5	+12 35.6
26	Regulus	208 30.4	+12 11.3
11	Rigel	281 54.1	− 8 14.9
38	Rigil Kent.	140 52.7	−60 39.1
44	Sabik	103 03.2	−15 40.2
3	Schedar	350 30.3	+56 17.7
45	Shaula	97 21.9	−37 04.5
18	Sirius	259 12.3	−16 39.0
33	Spica	159 18.0	−10 55.5
23	Suhail	223 25.0	−43 14.7
49	Vega	81 08.9	+38 44.7
39	Zub'g'bi	137 54.5	−15 51.3

Lat.	Sunrise	Twlt. begins	Moonrise 22	Moonrise 23	Moonrise 24	Moonrise 25
N °	h m	h m	h m	h m	h m	h m
72	8 02	4 05	1 20	3 13	5 04	7 00
70	7 46	4 13	1 27	3 12	4 56	6 42
68	7 32	4 19	1 34	3 12	4 49	6 27
66	7 22	4 25	1 39	3 12	4 43	6 15
64	7 13	4 29	1 43	3 11	4 38	6 06
62	7 05	4 33	1 47	3 11	4 34	5 57
60	6 58	4 36	1 50	3 11	4 31	5 50
58	6 52	4 39	1 53	3 11	4 28	5 44
56	6 47	4 41	1 56	3 11	4 25	5 39
54	6 42	4 42	1 58	3 11	4 22	5 34
52	6 38	4 43	2 00	3 11	4 20	5 29
50	6 34	4 44	2 02	3 11	4 18	5 25
45	6 25	4 46	2 06	3 10	4 14	5 16
40	6 18	4 47	2 10	3 10	4 10	5 09
35	6 12	4 46	2 13	3 10	4 07	5 03
30	6 07	4 46	2 15	3 10	4 04	4 58
20	5 57	4 43	2 20	3 10	3 59	4 48
10	5 49	4 38	2 24	3 10	3 55	4 40
0	5 41	4 31	2 28	3 10	3 51	4 33
10	5 33	4 21	2 31	3 10	3 47	4 25
20	5 24	4 09	2 35	3 09	3 43	4 17
30	5 14	3 51	2 40	3 09	3 39	4 09
35	5 08	3 39	2 42	3 09	3 36	4 03
40	5 01	3 25	2 45	3 09	3 33	3 58
45	4 53	3 05	2 49	3 09	3 30	3 51
50	4 44	2 40	2 53	3 09	3 26	3 43
52	4 40	2 27	2 54	3 09	3 24	3 39
54	4 35	2 10	2 56	3 09	3 22	3 35
56	4 29	1 51	2 59	3 09	3 20	3 31
58	4 23	1 24	3 01	3 09	3 17	3 26
60	4 16	0 40	3 04	3 09	3 14	3 20
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Lat.	Sunset	Twlt. ends	Moonset 22	Moonset 23	Moonset 24	Moonset 25
N °	h m	h m	h m	h m	h m	h m
72	15 25	19 18	15 17	14 55	14 32	14 04
70	15 42	19 10	15 14	14 59	14 43	14 24
68	15 55	19 04	15 12	15 02	14 52	14 40
66	16 06	18 59	15 10	15 04	14 59	14 53
64	16 15	18 55	15 08	15 07	15 05	15 04
62	16 23	18 52	15 06	15 08	15 11	15 14
60	16 30	18 50	15 05	15 10	15 16	15 22
58	16 36	18 48	15 03	15 12	15 20	15 29
56	16 41	18 45	15 02	15 13	15 23	15 35
54	16 46	18 44	15 01	15 14	15 27	15 41
52	16 50	18 43	15 00	15 15	15 30	15 46
50	16 54	18 42	15 00	15 16	15 33	15 51
45	17 03	18 41	14 58	15 18	15 39	16 01
40	17 10	18 40	14 56	15 20	15 44	16 09
35	17 16	18 41	14 55	15 22	15 49	16 17
30	17 21	18 41	14 54	15 23	15 53	16 23
20	17 31	18 45	14 52	15 26	15 59	16 34
10	17 40	18 51	14 50	15 28	16 05	16 44
0	17 48	18 58	14 48	15 30	16 11	16 53
10	17 56	19 08	14 46	15 32	16 17	17 03
20	18 05	19 21	14 44	15 34	16 23	17 12
30	18 15	19 39	14 42	15 36	16 30	17 24
35	18 21	19 51	14 41	15 38	16 34	17 30
40	18 28	20 07	14 39	15 39	16 39	17 38
45	18 36	20 26	14 37	15 41	16 44	17 47
50	18 46	20 53	14 35	15 43	16 50	17 57
52	18 50	21 07	14 34	15 44	16 53	18 02
54	18 55	21 23	14 33	15 45	16 57	18 08
56	19 01	21 45	14 32	15 46	17 00	18 14
58	19 07	22 13	14 31	15 48	17 04	18 21
60	19 14	23 04	14 29	15 49	17 09	18 28
S						

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.4	0.4	0.2
30			
	0.4	0.3	0.1
45			
	0.4	0.3	0.1
60			
	0.4	0.2	0.1
75			
	0.4	0.1	0.0
90			

Moon's Lower Limb Add

Alt.	22	23	24
°	′	′	′
0			
	13.3	12.8	12.2
4			
	13.3	12.8	12.3
8			
	13.3	12.8	12.3
12			
	13.3	12.8	12.3
16			
	13.3	12.9	12.4
20			
	13.4	12.9	12.4
24			
	13.4	13.0	12.5
28			
	13.5	13.0	12.6
32			
	13.6	13.1	12.7
36			
	13.6	13.2	12.8
40			
	13.7	13.3	12.9
44			
	13.8	13.4	13.0
48			
	13.9	13.5	13.2
52			
	14.0	13.7	13.3
56			
	14.1	13.8	13.5
60			
	14.2	13.9	13.6
64			
	14.3	14.1	13.8
68			
	14.4	14.2	14.0
72			
	14.6	14.3	14.1
76			
	14.7	14.5	14.3
80			
	14.8	14.6	14.5
84			
	14.9	14.8	14.7
88			
	15.0	14.9	14.8
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	22	23	24
°	′	′	′
0			
	16.9	17.2	17.4
4			
	16.8	17.1	17.4
8			
	16.8	17.1	17.4
12			
	16.8	17.1	17.4
16			
	16.8	17.0	17.3
20			
	16.7	17.0	17.3
24			
	16.7	16.9	17.2
28			
	16.6	16.9	17.1
32			
	16.6	16.8	17.0
36			
	16.5	16.7	16.9
40			
	16.4	16.6	16.8
44			
	16.3	16.5	16.6
48			
	16.2	16.4	16.5
52			
	16.1	16.2	16.4
56			
	16.0	16.1	16.2
60			
	15.9	16.0	16.1
64			
	15.8	15.8	15.9
68			
	15.7	15.7	15.7
72			
	15.6	15.6	15.6
76			
	15.4	15.4	15.4
80			
	15.3	15.3	15.2
84			
	15.2	15.1	15.0
88			
	15.1	15.0	14.9
90			

Subtract from table, back cover

Equation of Time (App.—Mean)

GMT	22	23	24
h	m s	m s	m s
0	+15 21.1	+15 30.2	+15 38.6
6	+15 23.4	+15 32.4	+15 40.6
12	+15 25.7	+15 34.5	+15 42.6
18	+15 28.0	+15 36.6	+15 44.5
24	+15 30.2	+15 38.6	+15 46.4

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
22	8 38	13 43	18 12	6 04	12 33
23	9 20	13 39	18 11	6 00	12 30
24	10 01	13 36	18 09	5 56	12 26
25	10 43	13 32	18 08	5 53	12 23

992941°—53——12

GMT	♈ GHA	VENUS −4.2 GHA	Dec.	MARS 0.0 GHA	Dec.	JUPITER −1.8 GHA	Dec.	SATURN 0.8 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
25 0	32 50.9	156 27.8	−26 19.8	87 43.8	−21 58.5	271 34.8	+20 31.9	173 49.4	−13 00.9	203 49.2	154	− 9 21.2	−116
1	47 53.3	171 30.2	19.8	102 44.6	58.1	286 37.1	31.9	188 51.6	01.0	218 23.6	155	9 32.8	−116
2	62 55.8	186 32.6	19.8	117 45.4	57.6	301 39.3	31.8	203 53.8	01.1	232 58.1	155	9 44.4	−115
3	77 58.2	201 35.0	·· 19.8	132 46.2	·· 57.2	316 41.6	·· 31.8	218 55.9	·· 01.2	247 32.6	154	· 9 55.9	−115
4	93 00.7	216 37.4	19.8	147 46.9	56.7	331 43.9	31.8	233 58.1	01.3	262 07.0	154	10 07.4	−115
5	108 03.2	231 39.8	19.7	162 47.7	56.3	346 46.2	31.7	249 00.3	01.4	276 41.4	154	10 18.9	−114
6	123 05.6	246 42.2	−26 19.7	177 48.5	−21 55.8	1 48.4	+20 31.7	264 02.4	−13 01.5	291 15.8	153	−10 30.3	−114
7	138 08.1	261 44.6	19.7	192 49.2	55.4	16 50.7	31.7	279 04.6	01.6	305 50.1	153	10 41.7	−113
8	153 10.6	276 47.0	19.7	207 50.0	54.9	31 53.0	31.7	294 06.8	01.7	320 24.4	153	10 53.0	−113
9	168 13.0	291 49.5	·· 19.6	222 50.8	·· 54.5	46 55.3	·· 31.6	309 09.0	·· 01.8	334 58.7	153	·11 04.3	−112
10	183 15.5	306 51.9	19.6	237 51.5	54.0	61 57.5	31.6	324 11.1	01.9	349 33.0	152	11 15.5	−112
11	198 18.0	321 54.3	19.6	252 52.3	53.6	76 59.8	31.6	339 13.3	02.0	4 07.2	153	11 26.7	−111
12	213 20.4	336 56.7	−26 19.5	267 53.1	−21 53.1	92 02.1	+20 31.5	354 15.5	−13 02.1	18 41.5	151	−11 37.8	−111
13	228 22.9	351 59.2	19.5	282 53.8	52.7	107 04.4	31.5	9 17.7	02.2	33 15.6	152	11 48.9	−110
14	243 25.4	7 01.6	19.5	297 54.6	52.2	122 06.6	31.5	24 19.8	02.2	47 49.8	151	11 59.9	−110
15	258 27.8	22 04.1	·· 19.4	312 55.4	·· 51.8	137 08.9	·· 31.4	39 22.0	·· 02.3	62 23.9	151	·12 10.9	−109
16	273 30.3	37 06.5	19.4	327 56.1	51.3	152 11.2	31.4	54 24.2	02.4	76 58.0	150	12 21.8	−109
17	288 32.7	52 09.0	19.4	342 56.9	50.9	167 13.5	31.4	69 26.4	02.5	91 32.0	151	12 32.7	−108
18	303 35.2	67 11.4	−26 19.3	357 57.7	−21 50.4	182 15.7	+20 31.3	84 28.5	−13 02.6	106 06.1	150	−12 43.5	−108
19	318 37.7	82 13.9	19.3	12 58.4	50.0	197 18.0	31.3	99 30.7	02.7	120 40.1	149	12 54.3	−107
20	333 40.1	97 16.3	19.2	27 59.2	49.5	212 20.3	31.3	114 32.9	02.8	135 14.0	149	13 05.0	−107
21	348 42.6	112 18.8	·· 19.2	43 00.0	·· 49.1	227 22.6	·· 31.3	129 35.1	·· 02.9	149 47.9	149	·13 15.7	−106
22	3 45.1	127 21.3	19.1	58 00.7	48.6	242 24.9	31.2	144 37.2	03.0	164 21.8	149	13 26.3	−105
23	18 47.5	142 23.8	19.1	73 01.5	48.1	257 27.1	31.2	159 39.4	03.1	178 55.7	148	13 36.8	−105
26 0	33 50.0	157 26.3	−26 19.0	88 02.3	−21 47.7	272 29.4	+20 31.2	174 41.6	−13 03.2	193 29.5	148	−13 47.3	−105
1	48 52.5	172 28.7	19.0	103 03.0	47.2	287 31.7	31.1	189 43.8	03.3	208 03.3	147	13 57.8	−103
2	63 54.9	187 31.2	18.9	118 03.8	46.8	302 34.0	31.1	204 45.9	03.4	222 37.0	147	14 08.1	−104
3	78 57.4	202 33.7	·· 18.9	133 04.6	·· 46.3	317 36.3	·· 31.1	219 48.1	·· 03.5	237 10.7	147	·14 18.5	−102
4	93 59.8	217 36.2	18.8	148 05.4	45.9	332 38.5	31.0	234 50.3	03.6	251 44.4	146	14 28.7	−102
5	109 02.3	232 38.7	18.7	163 06.1	45.4	347 40.8	31.0	249 52.5	03.7	266 18.0	146	14 38.9	−101
6	124 04.8	247 41.2	−26 18.7	178 06.9	−21 44.9	2 43.1	+20 31.0	264 54.6	−13 03.8	280 51.6	145	−14 49.0	−101
7	139 07.2	262 43.8	18.6	193 07.7	44.5	17 45.4	31.0	279 56.8	03.8	295 25.1	145	14 59.1	−100
8	154 09.7	277 46.3	18.5	208 08.4	44.0	32 47.7	30.9	294 59.0	03.9	309 58.6	145	15 09.1	− 99
9	169 12.2	292 48.8	·· 18.5	223 09.2	·· 43.6	47 50.0	·· 30.9	310 01.1	·· 04.0	324 32.1	145	·15 19.0	− 99
10	184 14.6	307 51.3	18.4	238 10.0	43.1	62 52.2	30.9	325 03.3	04.1	339 05.6	143	15 28.9	− 98
11	199 17.1	322 53.8	18.3	253 10.7	42.7	77 54.5	30.8	340 05.5	04.2	353 38.9	144	15 38.7	− 98
12	214 19.6	337 56.4	−26 18.2	268 11.5	−21 42.2	92 56.8	+20 30.8	355 07.7	−13 04.3	8 12.3	143	−15 48.5	− 97
13	229 22.0	352 58.9	18.2	283 12.2	41.7	107 59.1	30.8	10 09.8	04.4	22 45.6	143	15 58.2	− 96
14	244 24.5	8 01.5	18.1	298 13.0	41.3	123 01.4	30.7	25 12.0	04.5	37 18.9	142	16 07.8	− 95
15	259 27.0	23 04.0	·· 18.0	313 13.8	·· 40.8	138 03.7	·· 30.7	40 14.2	·· 04.6	51 52.1	142	·16 17.3	− 95
16	274 29.4	38 06.5	17.9	328 14.5	40.4	153 05.9	30.7	55 16.4	04.7	66 25.3	141	16 26.8	− 94
17	289 31.9	53 09.1	17.8	343 15.3	39.9	168 08.2	30.7	70 18.5	04.8	80 58.4	141	16 36.2	− 93
18	304 34.3	68 11.7	−26 17.8	358 16.1	−21 39.4	183 10.5	+20 30.6	85 20.7	−13 04.9	95 31.5	141	−16 45.5	− 93
19	319 36.8	83 14.2	17.7	13 16.8	39.0	198 12.8	30.6	100 22.9	05.0	110 04.6	140	16 54.8	− 92
20	334 39.3	98 16.8	17.6	28 17.6	38.5	213 15.1	30.6	115 25.1	05.1	124 37.6	139	17 04.0	− 91
21	349 41.7	113 19.4	·· 17.5	43 18.4	·· 38.1	228 17.4	·· 30.5	130 27.2	·· 05.2	139 10.5	140	·17 13.1	− 90
22	4 44.2	128 21.9	17.4	58 19.1	37.6	243 19.7	30.5	145 29.4	05.3	153 43.5	138	17 22.1	− 90
23	19 46.7	143 24.5	17.3	73 19.9	37.1	258 21.9	30.5	160 31.6	05.3	168 16.3	139	17 31.1	− 89
27 0	34 49.1	158 27.1	−26 17.2	88 20.7	−21 36.7	273 24.2	+20 30.5	175 33.8	−13 05.4	182 49.2	138	−17 40.0	− 88
1	49 51.6	173 29.7	17.1	103 21.4	36.2	288 26.5	30.4	190 35.9	05.5	197 22.0	137	17 48.8	− 87
2	64 54.1	188 32.3	17.0	118 22.2	35.7	303 28.8	30.4	205 38.1	05.6	211 54.7	137	17 57.5	− 87
3	79 56.5	203 34.9	·· 16.9	133 23.0	·· 35.3	318 31.1	·· 30.4	220 40.3	·· 05.7	226 27.4	137	·18 06.2	− 86
4	94 59.0	218 37.5	16.8	148 23.7	34.8	333 33.4	30.3	235 42.4	05.8	241 00.1	136	18 14.8	− 85
5	110 01.5	233 40.1	16.7	163 24.5	34.3	348 35.7	30.3	250 44.6	05.9	255 32.7	135	18 23.3	− 84
6	125 03.9	248 42.7	−26 16.6	178 25.3	−21 33.9	3 38.0	+20 30.3	265 46.8	−13 06.0	270 05.2	135	−18 31.7	− 84
7	140 06.4	263 45.3	16.5	193 26.0	33.4	18 40.3	30.3	280 49.0	06.1	284 37.7	135	18 40.1	− 82
8	155 08.8	278 47.9	16.4	208 26.8	33.0	33 42.5	30.2	295 51.1	06.2	299 10.2	134	18 48.3	− 82
9	170 11.3	293 50.6	·· 16.3	223 27.5	·· 32.5	48 44.8	·· 30.2	310 53.3	·· 06.3	313 42.6	134	·18 56.5	− 81
10	185 13.8	308 53.2	16.1	238 28.3	32.0	63 47.1	30.2	325 55.5	06.4	328 15.0	133	19 04.6	− 81
11	200 16.2	323 55.8	16.0	253 29.1	31.6	78 49.4	30.2	340 57.7	06.5	342 47.3	133	19 12.7	− 79
12	215 18.7	338 58.4	−26 15.9	268 29.8	−21 31.1	93 51.7	+20 30.1	355 59.8	−13 06.6	357 19.6	133	−19 20.6	− 79
13	230 21.2	354 01.1	15.8	283 30.6	30.6	108 54.0	30.1	11 02.0	06.7	11 51.9	132	19 28.5	− 77
14	245 23.6	9 03.7	15.7	298 31.4	30.2	123 56.3	30.1	26 04.2	06.8	26 24.1	131	19 36.2	− 77
15	260 26.1	24 06.4	·· 15.5	313 32.1	·· 29.7	138 58.6	·· 30.0	41 06.3	·· 06.9	40 56.2	131	·19 43.9	− 76
16	275 28.6	39 09.0	15.4	328 32.9	29.2	154 00.9	30.0	56 08.5	06.9	55 28.3	131	19 51.5	− 75
17	290 31.0	54 11.7	15.3	343 33.7	28.8	169 03.2	30.0	71 10.7	07.0	70 00.4	130	19 59.0	− 75
18	305 33.5	69 14.4	−26 15.1	358 34.4	−21 28.3	184 05.5	+20 30.0	86 12.9	−13 07.1	84 32.4	129	−20 06.5	− 73
19	320 35.9	84 17.0	15.0	13 35.2	27.8	199 07.8	29.9	101 15.0	07.2	99 04.3	130	20 13.8	− 72
20	335 38.4	99 19.7	14.9	28 35.9	27.3	214 10.1	29.9	116 17.2	07.3	113 36.3	128	20 21.0	− 72
21	350 40.9	114 22.4	·· 14.7	43 36.7	·· 26.9	229 12.3	·· 29.9	131 19.4	·· 07.4	128 08.1	129	·20 28.2	− 71
22	5 43.3	129 25.0	14.6	58 37.5	26.4	244 14.6	29.8	146 21.6	07.5	142 40.0	127	20 35.3	− 69
23	20 45.8	144 27.7	14.5	73 38.2	25.9	259 16.9	29.8	161 23.7	07.6	157 11.7	128	20 42.2	− 69
24	35 48.3	159 30.4	−26 14.3	88 39.0	−21 25.5	274 19.2	+20 29.8	176 25.9	−13 07.7	171 43.5	127	−20 49.1	− 68
code	−	+ 25	0	+ 7	+ 5	+ 23	0	+ 21	− 1				

GMT h	SUN GHA ° ′	SUN Dec. ° ′
25 0	183 56.6	−11 50.4
1	198 56.7	51.2
2	213 56.8	52.1
3	228 56.9	.. 53.0
4	243 56.9	53.8
5	258 57.0	54.7
6	273 57.1	−11 55.6
7	288 57.2	56.4
8	303 57.2	57.3
9	318 57.3	.. 58.2
10	333 57.4	59.0
11	348 57.5	11 59.9
12	3 57.5	−12 00.7
13	18 57.6	01.6
14	33 57.7	02.5
15	48 57.7	.. 03.3
16	63 57.8	04.2
17	78 57.9	05.1
18	93 58.0	−12 05.9
19	108 58.0	06.8
20	123 58.1	07.7
21	138 58.2	.. 08.5
22	153 58.2	09.4
23	168 58.3	10.2
26 0	183 58.4	−12 11.1
1	198 58.4	12.0
2	213 58.5	12.8
3	228 58.6	.. 13.7
4	243 58.6	14.5
5	258 58.7	15.4
6	273 58.8	−12 16.3
7	288 58.9	17.1
8	303 58.9	18.0
9	318 59.0	.. 18.8
10	333 59.1	19.7
11	348 59.1	20.5
12	3 59.2	−12 21.4
13	18 59.2	22.3
14	33 59.3	23.1
15	48 59.4	.. 24.0
16	63 59.4	24.8
17	78 59.5	25.7
18	93 59.6	−12 26.5
19	108 59.6	27.4
20	123 59.7	28.2
21	138 59.8	.. 29.1
22	153 59.8	30.0
23	168 59.9	30.8
27 0	183 59.9	−12 31.7
1	199 00.0	32.5
2	214 00.1	33.4
3	229 00.1	.. 34.2
4	244 00.2	35.1
5	259 00.2	35.9
6	274 00.3	−12 36.8
7	289 00.4	37.6
8	304 00.4	38.5
9	319 00.5	.. 39.3
10	334 00.5	40.2
11	349 00.6	41.0
12	4 00.7	−12 41.9
13	19 00.7	42.7
14	34 00.8	43.6
15	49 00.8	.. 44.4
16	64 00.9	45.3
17	79 00.9	46.1
18	94 01.0	−12 47.0
19	109 01.1	47.8
20	124 01.1	48.6
21	139 01.2	.. 49.5
22	154 01.2	50.3
23	169 01.3	51.2
24	184 01.3	−12 52.0
code	—	− 9

STARS No.	Name	SHA ° ′	Dec. ° ′
7	Acamar	315 51.2	−40 28.9
5	Achernar	335 58.7	−57 27.8
30	Acrux	173 59.3	−62 50.9
19	Adhara	255 47.0	−28 54.3
10	Aldebaran	291 39.6	+16 25.3
32	Alioth	166 59.6	+56 12.1
34	Alkaid	153 33.9	+49 32.2
55	Al Na'ir	28 38.6	−47 10.9
15	Alnilam	276 30.8	− 1 13.6
25	Alphard	218 39.4	− 8 27.6
41	Alphecca	126 48.5	+26 52.0
1	Alpheratz	358 28.8	+28 50.8
51	Altair	62 51.2	+ 8 45.0
2	Ankaa	353 58.5	−42 33.0
42	Antares	113 20.5	−26 20.0
37	Arcturus	146 36.1	+19 25.0
43	Atria	109 02.3	−68 57.1
22	Avior	234 36.1	−59 21.5
13	Bellatrix	279 18.9	+ 6 18.8
16	Betelg'se	271 48.7	+ 7 24.1
17	Canopus	264 15.4	−52 39.9
12	Capella	281 39.1	+45 57.2
53	Deneb	50 01.5	+45 07.4
28	Denebola	183 18.7	+14 49.4
4	Diphda	349 39.6	−18 13.9
27	Dubhe	194 45.8	+61 59.5
14	Elnath	279 08.0	+28 34.3
47	Eltanin	91 06.9	+51 29.9
54	Enif	34 30.2	+ 9 40.3
56	Fomalhaut	16 12.1	−29 51.7
31	Gacrux	172 50.6	−56 51.5
29	Gienah	176 37.9	−17 17.4
35	Hadar	149 51.1	−60 09.4
6	Hamal	328 50.1	+23 15.2
48	Kaus Aust.	84 42.3	−34 24.6
40	Kochab	137 18.9	+74 20.4
57	Markab	14 21.9	+14 58.0
8	Menkar	315 00.7	+ 3 55.0
36	Menkent	148 59.9	−36 08.9
24	Miapl'dus	221 49.5	−69 31.6
9	Mirfak	309 42.9	+49 42.2
50	Nunki	76 52.9	−26 21.3
52	Peacock	54 28.3	−56 53.1
21	Pollux	244 21.3	+28 08.2
20	Procyon	245 45.6	+ 5 20.6
46	R'alhague	96 47.5	+12 35.6
26	Regulus	208 30.4	+12 11.3
11	Rigel	281 54.1	− 8 14.9
38	Rigil Kent.	140 52.7	−60 39.1
44	Sabik	103 03.2	−15 40.2
3	Schedar	350 30.3	+56 17.7
45	Shaula	97 21.9	−37 04.5
18	Sirius	259 12.3	−16 39.0
33	Spica	159 17.9	−10 55.5
23	Suhail	223 25.0	−43 14.7
49	Vega	81 08.9	+38 44.7
39	Zub'g'bi	137 54.5	−15 51.3

Lat. °	Sunrise h m	Twlt. begins h m	Moonrise 25 h m	Moonrise 26 h m	Moonrise 27 h m	Moonrise 28 h m
N 72	8 19	4 18	7 00	9 16	■	■
70	7 59	4 25	6 42	8 37	11 06	■
68	7 44	4 30	6 27	8 11	10 05	■
66	7 32	4 35	6 15	7 51	9 30	11 17
64	7 22	4 38	6 06	7 35	9 05	10 37
62	7 13	4 40	5 57	7 21	8 46	10 10
60	7 06	4 43	5 50	7 10	8 30	9 49
58	6 59	4 45	5 44	7 01	8 17	9 32
56	6 53	4 46	5 39	6 52	8 06	9 17
54	6 48	4 47	5 34	6 45	7 56	9 05
52	6 43	4 48	5 29	6 38	7 47	8 54
50	6 39	4 49	5 25	6 32	7 39	8 44
45	6 29	4 50	5 16	6 19	7 22	8 24
40	6 22	4 50	5 09	6 09	7 08	8 07
35	6 15	4 49	5 03	6 00	6 57	7 53
30	6 09	4 48	4 58	5 52	6 46	7 41
20	5 59	4 44	4 48	5 38	6 29	7 21
10	5 49	4 38	4 40	5 27	6 14	7 03
0	5 41	4 31	4 33	5 16	6 00	6 46
10	5 32	4 20	4 25	5 05	5 46	6 30
20	5 22	4 07	4 17	4 53	5 31	6 12
30	5 11	3 47	4 09	4 40	5 14	5 52
35	5 05	3 35	4 03	4 33	5 05	5 41
40	4 57	3 19	3 58	4 24	4 53	5 27
45	4 49	2 59	3 51	4 14	4 40	5 11
50	4 38	2 31	3 43	4 02	4 25	4 52
52	4 33	2 16	3 39	3 56	4 17	4 43
54	4 28	1 58	3 35	3 50	4 09	4 32
56	4 22	1 35	3 31	3 44	4 00	4 21
58	4 16	1 03	3 26	3 36	3 49	4 08
S 60	4 08	////	3 20	3 27	3 37	3 52

Lat. °	Sunset h m	Twlt. ends h m	Moonset 25 h m	Moonset 26 h m	Moonset 27 h m	Moonset 28 h m
N 72	15 08	19 04	14 04	13 19	■	■
70	15 27	18 58	14 24	13 59	13 03	■
68	15 42	18 53	14 40	14 26	14 05	■
66	15 55	18 50	14 53	14 47	14 40	14 30
64	16 05	18 46	15 04	15 04	15 06	15 10
62	16 14	18 44	15 14	15 18	15 26	15 38
60	16 21	18 41	15 22	15 30	15 42	16 00
58	16 28	18 40	15 29	15 41	15 56	16 18
56	16 34	18 39	15 35	15 50	16 08	16 32
54	16 39	18 38	15 41	15 58	16 18	16 45
52	16 44	18 37	15 46	16 05	16 28	16 57
50	16 48	18 36	15 51	16 11	16 36	17 07
45	16 58	18 36	16 01	16 26	16 54	17 28
40	17 06	18 37	16 09	16 37	17 09	17 45
35	17 13	18 38	16 17	16 47	17 21	17 59
30	17 19	18 39	16 23	16 56	17 32	18 12
20	17 29	18 43	16 34	17 11	17 51	18 33
10	17 39	18 50	16 44	17 24	18 07	18 52
0	17 47	18 57	16 53	17 37	18 22	19 09
10	17 56	19 08	17 03	17 49	18 38	19 27
20	18 06	19 23	17 12	18 03	18 54	19 46
30	18 17	19 42	17 24	18 18	19 13	20 07
35	18 24	19 55	17 30	18 27	19 24	20 20
40	18 31	20 11	17 38	18 37	19 37	20 35
45	18 40	20 32	17 47	18 50	19 52	20 52
50	18 51	21 01	17 57	19 04	20 10	21 14
52	18 56	21 16	18 02	19 11	20 19	21 24
54	19 01	21 34	18 08	19 19	20 29	21 36
56	19 07	21 58	18 14	19 27	20 40	21 49
58	19 14	22 34	18 21	19 37	20 53	22 05
S 60	19 22	////	18 28	19 48	21 08	22 24

GMT h	Equation of Time (App.—Mean) 25 m s	26 m s	27 m s
0	+15 46.4	+15 53.4	+15 59.7
6	+15 48.2	+15 55.0	+16 01.1
12	+15 50.0	+15 56.6	+16 02.5
18	+15 51.7	+15 58.2	+16 03.9
24	+15 53.4	+15 59.7	+16 05.2

GMT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
25	10 43	13 32	18 08	5 53	12 23
26	11 26	13 28	18 07	5 49	12 19
27	12 11	13 24	18 06	5 46	12 16
28	12 58	13 20	18 05	5 42	12 13

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0			
	0.4	0.4	0.2
30			
	0.4	0.4	0.1
45			
	0.4	0.3	0.1
60			
	0.4	0.2	0.1
75			
	0.4	0.1	0.0
90			

Moon's Lower Limb Add

Alt. °	25 ′	26 ′	27 ′
0			
	12.0	11.7	11.6
4			
	12.0	11.7	11.6
8			
	12.0	11.8	11.7
12			
	12.1	11.8	11.7
16			
	12.1	11.9	11.8
20			
	12.2	12.0	11.8
24			
	12.3	12.0	11.9
28			
	12.4	12.1	12.0
32			
	12.5	12.2	12.1
36			
	12.6	12.4	12.3
40			
	12.7	12.5	12.4
44			
	12.8	12.6	12.6
48			
	13.0	12.8	12.7
52			
	13.1	13.0	12.9
56			
	13.3	13.1	13.1
60			
	13.5	13.3	13.3
64			
	13.6	13.5	13.4
68			
	13.8	13.7	13.6
72			
	14.0	13.9	13.9
76			
	14.2	14.1	14.1
80			
	14.4	14.3	14.3
84			
	14.6	14.5	14.5
88			
	14.7	14.7	14.7
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt. °	25 ′	26 ′	27 ′
0			
	17.6	17.7	17.8
4			
	17.6	17.7	17.8
8			
	17.5	17.7	17.8
12			
	17.5	17.6	17.7
16			
	17.5	17.6	17.7
20			
	17.4	17.5	17.6
24			
	17.3	17.4	17.5
28			
	17.2	17.3	17.4
32			
	17.1	17.2	17.3
36			
	17.0	17.1	17.2
40			
	16.9	17.0	17.0
44			
	16.7	16.8	16.9
48			
	16.6	16.7	16.7
52			
	16.4	16.5	16.5
56			
	16.3	16.3	16.4
60			
	16.1	16.1	16.2
64			
	15.9	16.0	16.0
68			
	15.7	15.8	15.8
72			
	15.6	15.6	15.6
76			
	15.4	15.4	15.4
80			
	15.2	15.2	15.1
84			
	15.0	14.9	14.9
88			
	14.8	14.8	14.8
90			

Subtract from table, back cover

New Moon 26

Day	GMT	♈ GHA	VENUS −4.1 GHA	Dec.	MARS 0.0 GHA	Dec.	JUPITER −1.8 GHA	Dec.	SATURN 0.8 GHA	Dec.	MOON GHA	code	Dec.	code
	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
28	0	35 48.3	159 30.4	−26 14.3	88 39.0	−21 25.5	274 19.2	+20 29.8	176 25.9	−13 07.7	171 43.5	127	−20 49.1	−68
	1	50 50.7	174 33.1	14.2	103 39.8	25.0	289 21.5	29.8	191 28.1	07.8	186 15.2	126	20 55.9	−67
	2	65 53.2	189 35.8	14.0	118 40.5	24.5	304 23.8	29.7	206 30.2	07.9	200 46.8	126	21 02.6	−66
	3	80 55.7	204 38.5	·· 13.9	133 41.3	·· 24.1	319 26.1	·· 29.7	221 32.4	·· 08.0	215 18.4	125	·21 09.2	−66
	4	95 58.1	219 41.2	13.7	148 42.1	23.6	334 28.4	29.7	236 34.6	08.1	229 49.9	125	21 15.8	−64
	5	111 00.6	234 43.9	13.6	163 42.8	23.1	349 30.7	29.7	251 36.8	08.2	244 21.4	125	21 22.2	−63
	6	126 03.1	249 46.6	−26 13.4	178 43.6	−21 22.6	4 33.0	+20 29.6	266 38.9	−13 08.3	258 52.9	124	−21 28.5	−62
	7	141 05.5	264 49.3	13.3	193 44.3	22.2	19 35.3	29.6	281 41.1	08.4	273 24.3	124	21 34.7	−62
	8	156 08.0	279 52.1	13.1	208 45.1	21.7	34 37.6	29.6	296 43.3	08.4	287 55.7	123	21 40.9	−60
	9	171 10.4	294 54.8	·· 13.0	223 45.9	·· 21.2	49 39.9	·· 29.6	311 45.5	·· 08.5	302 27.0	123	·21 46.9	−59
	10	186 12.9	309 57.5	12.8	238 46.6	20.7	64 42.2	29.5	326 47.6	08.6	316 58.3	123	21 52.8	−59
	11	201 15.4	325 00.3	12.6	253 47.4	20.3	79 44.5	29.5	341 49.8	08.7	331 29.6	122	21 58.7	−57
	12	216 17.8	340 03.0	−26 12.5	268 48.2	−21 19.8	94 46.8	+20 29.5	356 52.0	−13 08.8	346 00.8	121	−22 04.4	−57
	13	231 20.3	355 05.7	12.3	283 48.9	19.3	109 49.1	29.4	11 54.1	08.9	0 31.9	121	22 10.1	−55
	14	246 22.8	10 08.5	12.1	298 49.7	18.9	124 51.4	29.4	26 56.3	09.0	15 03.0	121	22 15.6	−54
	15	261 25.2	25 11.2	·· 12.0	313 50.4	·· 18.4	139 53.7	·· 29.4	41 58.5	·· 09.1	29 34.1	120	·22 21.0	−54
	16	276 27.7	40 14.0	11.8	328 51.2	17.9	154 56.0	29.4	57 00.7	09.2	44 05.1	120	22 26.4	−52
	17	291 30.2	55 16.8	11.6	343 52.0	17.4	169 58.3	29.3	72 02.8	09.3	58 36.1	120	22 31.6	−52
	18	306 32.6	70 19.5	−26 11.5	358 52.7	−21 17.0	185 00.6	+20 29.3	87 05.0	−13 09.4	73 07.1	119	−22 36.8	−50
	19	321 35.1	85 22.3	11.3	13 53.5	16.5	200 02.9	29.3	102 07.2	09.5	87 38.0	118	22 41.8	−49
	20	336 37.6	100 25.1	11.1	28 54.2	16.0	215 05.2	29.3	117 09.4	09.6	102 08.8	119	22 46.7	−48
	21	351 40.0	115 27.8	·· 10.9	43 55.0	·· 15.5	230 07.5	·· 29.2	132 11.5	·· 09.7	116 39.7	117	·22 51.5	−48
	22	6 42.5	130 30.6	10.7	58 55.8	15.0	245 09.8	29.2	147 13.7	09.8	131 10.4	118	22 56.3	−46
	23	21 44.9	145 33.4	10.5	73 56.5	14.6	260 12.1	29.2	162 15.9	09.8	145 41.2	117	23 00.9	−45
29	0	36 47.4	160 36.2	−26 10.4	88 57.3	−21 14.1	275 14.4	+20 29.2	177 18.0	−13 09.9	160 11.9	117	−23 05.4	−44
	1	51 49.9	175 39.0	10.2	103 58.1	13.6	290 16.7	29.1	192 20.2	10.0	174 42.6	116	23 09.8	−43
	2	66 52.3	190 41.8	10.0	118 58.8	13.1	305 19.0	29.1	207 22.4	10.1	189 13.2	116	23 14.1	−42
	3	81 54.8	205 44.6	·· 09.8	133 59.6	·· 12.7	320 21.3	·· 29.1	222 24.6	·· 10.2	203 43.8	116	·23 18.3	−41
	4	96 57.3	220 47.4	09.6	149 00.3	12.2	335 23.6	29.1	237 26.7	10.3	218 14.4	115	23 22.4	−40
	5	111 59.7	235 50.2	09.4	164 01.1	11.7	350 25.9	29.0	252 28.9	10.4	232 44.9	115	23 26.4	−38
	6	127 02.2	250 53.0	−26 09.2	179 01.9	−21 11.2	5 28.2	+20 29.0	267 31.1	−13 10.5	247 15.4	114	−23 30.2	−38
	7	142 04.7	265 55.8	09.0	194 02.6	10.7	20 30.6	29.0	282 33.3	10.6	261 45.8	115	23 34.0	−36
	8	157 07.1	280 58.7	08.8	209 03.4	10.3	35 32.9	29.0	297 35.4	10.7	276 16.3	113	23 37.6	−36
	9	172 09.6	296 01.5	·· 08.6	224 04.1	·· 09.8	50 35.2	·· 28.9	312 37.6	·· 10.8	290 46.6	114	·23 41.2	−34
	10	187 12.0	311 04.3	08.4	239 04.9	09.3	65 37.5	28.9	327 39.8	10.9	305 17.0	113	23 44.6	−33
	11	202 14.5	326 07.2	08.2	254 05.7	08.8	80 39.8	28.9	342 41.9	11.0	319 47.3	113	23 47.9	−32
	12	217 17.0	341 10.0	−26 08.0	269 06.4	−21 08.3	95 42.1	+20 28.9	357 44.1	−13 11.1	334 17.6	113	−23 51.1	−31
	13	232 19.4	356 12.9	07.7	284 07.2	07.9	110 44.4	28.8	12 46.3	11.2	348 47.9	112	23 54.2	−30
	14	247 21.9	11 15.7	07.5	299 07.9	07.4	125 46.7	28.8	27 48.5	11.3	3 18.1	112	23 57.2	−29
	15	262 24.4	26 18.6	·· 07.3	314 08.7	·· 06.9	140 49.0	·· 28.8	42 50.6	·· 11.3	17 48.3	111	·24 00.1	−27
	16	277 26.8	41 21.4	07.1	329 09.5	06.4	155 51.3	28.8	57 52.8	11.4	32 18.4	112	24 02.8	−27
	17	292 29.3	56 24.3	06.9	344 10.2	05.9	170 53.6	28.7	72 55.0	11.5	46 48.6	111	24 05.5	−25
	18	307 31.8	71 27.1	−26 06.6	359 11.0	−21 05.5	185 55.9	+20 28.7	87 57.1	−13 11.6	61 18.7	111	−24 08.0	−25
	19	322 34.2	86 30.0	06.4	14 11.7	05.0	200 58.2	28.7	102 59.3	11.7	75 48.8	110	24 10.5	−23
	20	337 36.7	101 32.9	06.2	29 12.5	04.5	216 00.6	28.7	118 01.5	11.8	90 18.8	111	24 12.8	−22
	21	352 39.2	116 35.8	·· 06.0	44 13.3	·· 04.0	231 02.9	·· 28.6	133 03.7	·· 11.9	104 48.9	110	·24 15.0	−20
	22	7 41.6	131 38.7	05.7	59 14.0	03.5	246 05.2	28.6	148 05.8	12.0	119 18.9	110	24 17.0	−20
	23	22 44.1	146 41.5	05.5	74 14.8	03.0	261 07.5	28.6	163 08.0	12.1	133 48.9	109	24 19.0	−18
30	0	37 46.5	161 44.4	−26 05.3	89 15.5	−21 02.6	276 09.8	+20 28.6	178 10.2	−13 12.2	148 18.8	109	−24 20.8	−18
	1	52 49.0	176 47.3	05.0	104 16.3	02.1	291 12.1	28.5	193 12.3	12.3	162 48.7	110	24 22.6	−16
	2	67 51.5	191 50.2	04.8	119 17.1	01.6	306 14.4	28.5	208 14.5	12.4	177 18.7	108	24 24.2	−15
	3	82 53.9	206 53.1	·· 04.6	134 17.8	·· 01.1	321 16.7	·· 28.5	223 16.7	·· 12.5	191 48.5	109	·24 25.7	−14
	4	97 56.4	221 56.0	04.3	149 18.6	00.6	336 19.0	28.5	238 18.9	12.6	206 18.4	109	24 27.1	−13
	5	112 58.9	236 59.0	04.1	164 19.3	21 00.1	351 21.4	28.5	253 21.0	12.7	220 48.3	108	24 28.4	−11
	6	128 01.3	252 01.9	−26 03.8	179 20.1	−20 59.6	6 23.7	+20 28.4	268 23.2	−13 12.7	235 18.1	108	−24 29.5	−10
	7	143 03.8	267 04.8	03.6	194 20.9	59.2	21 26.0	28.4	283 25.4	12.8	249 47.9	108	24 30.5	−10
	8	158 06.3	282 07.7	03.3	209 21.6	58.7	36 28.3	28.4	298 27.5	12.9	264 17.7	108	24 31.5	−8
	9	173 08.7	297 10.7	·· 03.1	224 22.4	·· 58.2	51 30.6	·· 28.4	313 29.7	·· 13.0	278 47.5	107	·24 32.3	−6
	10	188 11.2	312 13.6	02.8	239 23.1	57.7	66 32.9	28.3	328 31.9	13.1	293 17.2	108	24 32.9	−6
	11	203 13.7	327 16.5	02.5	254 23.9	57.2	81 35.2	28.3	343 34.1	13.2	307 47.0	107	24 33.5	−5
	12	218 16.1	342 19.5	−26 02.3	269 24.7	−20 56.7	96 37.6	+20 28.3	358 36.2	−13 13.3	322 16.7	107	−24 34.0	−3
	13	233 18.6	357 22.4	02.0	284 25.4	56.2	111 39.9	28.3	13 38.4	13.4	336 46.4	107	24 34.3	−2
	14	248 21.0	12 25.4	01.8	299 26.2	55.7	126 42.2	28.2	28 40.6	13.5	351 16.1	107	24 34.5	−1
	15	263 23.5	27 28.3	·· 01.5	314 26.9	·· 55.2	141 44.5	·· 28.2	43 42.8	·· 13.6	5 45.8	107	·24 34.6	0
	16	278 26.0	42 31.3	01.2	329 27.7	54.8	156 46.8	28.2	58 44.9	13.7	20 15.5	107	24 34.6	+2
	17	293 28.4	57 34.3	01.0	344 28.4	54.3	171 49.1	28.2	73 47.1	13.8	34 45.2	106	24 34.4	+2
	18	308 30.9	72 37.2	−26 00.7	359 29.2	−20 53.8	186 51.5	+20 28.2	88 49.3	−13 13.9	49 14.8	107	−24 34.2	+4
	19	323 33.4	87 40.2	00.4	14 30.0	53.3	201 53.8	28.1	103 51.4	14.0	63 44.5	106	24 33.8	+5
	20	338 35.8	102 43.2	26 00.1	29 30.7	52.8	216 56.1	28.1	118 53.6	14.1	78 14.1	106	24 33.3	+6
	21	353 38.3	117 46.2	·25 59.9	44 31.5	·· 52.3	231 58.4	·· 28.1	133 55.8	·· 14.1	92 43.7	107	·24 32.7	+8
	22	8 40.8	132 49.1	59.6	59 32.2	51.8	247 00.7	28.1	148 58.0	14.2	107 13.4	106	24 31.9	+8
	23	23 43.2	147 52.1	59.3	74 33.0	51.3	262 03.0	28.0	164 00.1	14.3	121 43.0	106	24 31.1	+10
	24	38 45.7	162 55.1	−25 59.0	89 33.8	−20 50.8	277 05.4	+20 28.0	179 02.3	−13 14.4	136 12.6	106	−24 30.1	+11
	code	−	+29	+3	+8	+4	+23	−1	+22	−1				

GMT		SUN GHA	SUN Dec.
	h	° ′	° ′
28	0	184 01.3	−12 52.0
	1	199 01.4	52.9
	2	214 01.4	53.7
	3	229 01.5	·· 54.6
	4	244 01.5	55.4
	5	259 01.6	56.2
	6	274 01.6	−12 57.1
	7	289 01.7	57.9
	8	304 01.8	58.8
	9	319 01.8	·12 59.6
	10	334 01.9	13 00.4
	11	349 01.9	01.3
	12	4 02.0	−13 02.1
	13	19 02.0	03.0
	14	34 02.1	03.8
	15	49 02.1	·· 04.6
	16	64 02.2	05.5
	17	79 02.2	06.3
	18	94 02.2	−13 07.2
	19	109 02.3	08.0
	20	124 02.3	08.8
	21	139 02.4	·· 09.7
	22	154 02.4	10.5
	23	169 02.5	11.3
29	0	184 02.5	−13 12.2
	1	199 02.6	13.0
	2	214 02.6	13.9
	3	229 02.7	·· 14.7
	4	244 02.7	15.5
	5	259 02.8	16.4
	6	274 02.8	−13 17.2
	7	289 02.8	18.0
	8	304 02.9	18.9
	9	319 02.9	·· 19.7
	10	334 03.0	20.5
	11	349 03.0	21.4
	12	4 03.1	−13 22.2
	13	19 03.1	23.0
	14	34 03.1	23.9
	15	49 03.2	·· 24.7
	16	64 03.2	25.5
	17	79 03.3	26.3
	18	94 03.3	−13 27.2
	19	109 03.3	28.0
	20	124 03.4	28.8
	21	139 03.4	·· 29.7
	22	154 03.5	30.5
	23	169 03.5	31.3
30	0	184 03.5	−13 32.1
	1	199 03.6	33.0
	2	214 03.6	33.8
	3	229 03.6	·· 34.6
	4	244 03.7	35.4
	5	259 03.7	36.3
	6	274 03.8	−13 37.1
	7	289 03.8	37.9
	8	304 03.8	38.7
	9	319 03.9	·· 39.6
	10	334 03.9	40.4
	11	349 03.9	41.2
	12	4 04.0	−13 42.0
	13	19 04.0	42.9
	14	34 04.0	43.7
	15	49 04.1	·· 44.5
	16	64 04.1	45.3
	17	79 04.1	46.1
	18	94 04.2	−13 47.0
	19	109 04.2	47.8
	20	124 04.2	48.6
	21	139 04.3	·· 49.4
	22	154 04.3	50.2
	23	169 04.3	51.1
	24	184 04.4	−13 51.9
code		—	− 8

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.2	−40 28.9
5	Achernar	335 58.7	−57 27.8
30	Acrux	173 59.3	−62 50.8
19	Adhara	255 46.9	−28 54.3
10	Aldebaran	291 39.6	+16 25.3
32	Alioth	166 59.6	+56 12.1
34	Alkaid	153 33.9	+49 32.2
55	Al Na'ir	28 38.6	−47 10.9
15	Alnilam	276 30.7	− 1 13.6
25	Alphard	218 39.3	− 8 27.6
41	Alphecca	126 48.5	+26 52.0
1	Alpheratz	358 28.8	+28 50.8
51	Altair	62 51.2	+ 8 45.0
2	Ankaa	353 58.5	−42 33.0
42	Antares	113 20.5	−26 20.0
37	Arcturus	146 36.1	+19 25.0
43	Atria	109 02.4	−68 57.0
22	Avior	234 36.1	−59 21.5
13	Bellatrix	279 18.9	+ 6 18.8
16	Betelg'se	271 48.7	+ 7 24.1
17	Canopus	264 15.4	−52 39.9
12	Capella	281 39.1	+45 57.2
53	Deneb	50 01.5	+45 07.4
28	Denebola	183 18.7	+14 49.4
4	Diphda	349 39.6	−18 13.9
27	Dubhe	194 45.7	+61 59.4
14	Elnath	279 07.9	+28 34.3
47	Eltanin	91 06.9	+51 29.8
54	Enif	34 30.2	+ 9 40.3
56	Fomalhaut	16 12.1	−29 51.7
31	Gacrux	172 50.6	−56 51.5
29	Gienah	176 37.9	−17 17.4
35	Hadar	149 51.1	−60 09.4
6	Hamal	328 50.1	+23 15.2
48	Kaus Aust.	84 42.3	−34 24.6
40	Kochab	137 18.9	+74 20.4
57	Markab	14 21.9	+14 58.0
8	Menkar	315 00.7	+ 3 55.0
36	Menkent	148 59.9	−36 08.9
24	Miapl'dus	221 49.5	−69 31.6
9	Mirfak	309 42.9	+49 42.2
50	Nunki	76 52.9	−26 21.3
52	Peacock	54 28.3	−56 53.1
21	Pollux	244 21.3	+28 08.1
20	Procyon	245 45.6	+ 5 20.6
46	R'alhague	96 47.5	+12 35.6
26	Regulus	208 30.4	+12 11.3
11	Rigel	281 54.0	− 8 15.0
38	Rigil Kent.	140 52.7	−60 39.1
44	Sabik	103 03.2	−15 40.2
3	Schedar	350 30.3	+56 17.7
45	Shaula	97 21.9	−37 04.5
18	Sirius	259 12.3	−16 39.0
33	Spica	159 17.9	−10 55.5
23	Suhail	223 24.9	−43 14.7
49	Vega	81 08.9	+38 44.7
39	Zub'g'bi	137 54.5	−15 51.3

Lat.	Sunrise	Twlt. begins	Moonrise 28	29	30	31
N °	h m	h m	h m	h m	h m	h m
72	8 36	4 31	■	■	■	■
70	8 14	4 36	■	■	■	■
68	7 56	4 40	■	■	■	■
66	7 43	4 43	11 17	■	■	■
64	7 31	4 46	10 37	12 06	13 15	13 51
62	7 22	4 48	10 10	11 28	12 31	13 13
60	7 13	4 50	9 49	11 01	12 02	12 46
58	7 06	4 51	9 32	10 41	11 39	12 25
56	7 00	4 52	9 17	10 24	11 21	12 08
54	6 54	4 53	9 05	10 09	11 06	11 53
52	6 49	4 53	8 54	9 57	10 53	11 40
50	6 44	4 53	8 44	9 46	10 41	11 29
45	6 34	4 53	8 24	9 23	10 17	11 05
40	6 25	4 53	8 07	9 04	9 58	10 46
35	6 18	4 52	7 53	8 49	9 41	10 30
30	6 11	4 50	7 41	8 35	9 27	10 17
20	6 00	4 45	7 21	8 12	9 04	9 53
10	5 50	4 39	7 03	7 53	8 43	9 33
0	5 40	4 30	6 46	7 35	8 24	9 14
10	5 31	4 19	6 30	7 16	8 05	8 55
20	5 20	4 04	6 12	6 57	7 45	8 35
30	5 08	3 44	5 52	6 34	7 21	8 12
35	5 01	3 30	5 41	6 21	7 07	7 58
40	4 53	3 14	5 27	6 06	6 51	7 42
45	4 44	2 53	5 11	5 48	6 32	7 23
50	4 33	2 23	4 52	5 26	6 08	7 00
52	4 28	2 07	4 43	5 15	5 57	6 48
54	4 22	1 47	4 32	5 03	5 44	6 35
56	4 15	1 21	4 21	4 50	5 29	6 21
58	4 08	0 36	4 08	4 34	5 11	6 03
60 S	4 00	////	3 52	4 15	4 50	5 41

Lat.	Sunset	Twlt. ends	Moonset 28	29	30	31
N °	h m	h m	h m	h m	h m	h m
72	14 50	18 51	■	■	■	■
70	15 13	18 47	■	■	■	■
68	15 30	18 43	■	■	■	■
66	15 44	18 40	14 30	■	■	■
64	15 55	18 37	15 10	15 23	15 58	17 06
62	16 05	18 36	15 38	16 01	16 41	17 44
60	16 13	18 34	16 00	16 28	17 10	18 11
58	16 21	18 34	16 18	16 49	17 33	18 32
56	16 27	18 33	16 32	17 06	17 51	18 49
54	16 33	18 32	16 45	17 20	18 06	19 03
52	16 38	18 32	16 57	17 33	18 20	19 16
50	16 43	18 32	17 07	17 45	18 31	19 27
45	16 53	18 32	17 28	18 08	18 56	19 50
40	17 02	18 33	17 45	18 27	19 15	20 09
35	17 09	18 34	17 59	18 42	19 31	20 24
30	17 16	18 37	18 12	18 56	19 45	20 38
20	17 27	18 41	18 33	19 19	20 09	21 00
10	17 38	18 49	18 52	19 40	20 29	21 20
0	17 47	18 58	19 09	19 58	20 48	21 39
10	17 57	19 09	19 27	20 17	21 07	21 57
20	18 07	19 24	19 46	20 37	21 28	22 16
30	18 19	19 45	20 07	21 01	21 51	22 39
35	18 27	19 59	20 20	21 14	22 05	22 52
40	18 35	20 16	20 35	21 30	22 21	23 07
45	18 44	20 38	20 52	21 49	22 40	23 25
50	18 56	21 09	21 14	22 13	23 04	23 48
52	19 01	21 25	21 24	22 24	23 16	23 58
54	19 07	21 46	21 36	22 37	23 29	24 10
56	19 14	22 15	21 49	22 52	23 44	24 24
58	19 21	23 04	22 05	23 09	24 02	0 02
60 S	19 29	////	22 24	23 31	24 23	0 23

GMT	Equation of Time (App.—Mean) 28	29	30
h	m s	m s	m s
0	+16 05.2	+16 10.0	+16 14.1
6	+16 06.5	+16 11.1	+16 15.0
12	+16 07.7	+16 12.1	+16 15.8
18	+16 08.9	+16 13.1	+16 16.6
24	+16 10.0	+16 14.1	+16 17.4

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
28	12 58	13 20	18 05	5 42	12 13
29	13 46	13 15	18 03	5 38	12 09
30	14 36	13 11	18 02	5 35	12 06
31	15 27	13 06	18 01	5 31	12 02

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.4	0.4	0.1
30			
	0.4	0.4	0.1
45			
	0.4	0.3	0.1
60			
	0.4	0.2	0.1
75			
	0.4	0.1	0.0
90			

Moon's Lower Limb Add

Alt.	28	29	30
°	′	′	′
0			
	11.6	11.7	12.1
4			
	11.6	11.7	12.1
8			
	11.7	11.8	12.2
12			
	11.7	11.8	12.2
16			
	11.8	11.9	12.2
20			
	11.8	12.0	12.3
24			
	11.9	12.0	12.4
28			
	12.0	12.1	12.5
32			
	12.1	12.2	12.6
36			
	12.3	12.4	12.7
40			
	12.4	12.5	12.8
44			
	12.6	12.6	12.9
48			
	12.7	12.8	13.1
52			
	12.9	13.0	13.2
56			
	13.1	13.1	13.4
60			
	13.3	13.3	13.5
64			
	13.4	13.5	13.7
68			
	13.6	13.7	13.9
72			
	13.9	13.9	14.1
76			
	14.1	14.1	14.3
80			
	14.3	14.3	14.4
84			
	14.5	14.5	14.6
88			
	14.7	14.7	14.8
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	28	29	30
°	′	′	′
0			
	17.8	17.7	17.5
4			
	17.8	17.7	17.5
8			
	17.8	17.7	17.5
12			
	17.7	17.6	17.4
16			
	17.7	17.6	17.4
20			
	17.6	17.5	17.3
24			
	17.5	17.4	17.2
28			
	17.4	17.3	17.2
32			
	17.3	17.2	17.1
36			
	17.2	17.1	16.9
40			
	17.0	17.0	16.8
44			
	16.9	16.8	16.7
48			
	16.7	16.7	16.6
52			
	16.5	16.5	16.4
56			
	16.4	16.3	16.2
60			
	16.2	16.1	16.1
64			
	16.0	16.0	15.9
68			
	15.8	15.8	15.7
72			
	15.6	15.6	15.6
76			
	15.4	15.4	15.4
80			
	15.1	15.2	15.2
84			
	14.9	14.9	15.0
88			
	14.8	14.8	14.9
90			

Subtract from table, back cover

GMT		♈	VENUS −4.0		MARS 0.1		JUPITER −1.8		SATURN 0.7		MOON			
	h	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
		° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
31	0	38 45.7	162 55.1	−25 59.0	89 33.8	−20 50.8	277 05.4	+20 28.0	179 02.3	−13 14.4	136 12.6	106	−24 30.1	+ 11
	1	53 48.1	177 58.1	58.7	104 34.5	50.3	292 07.7	28.0	194 04.5	14.5	150 42.2	106	24 29.0	+ 12
	2	68 50.6	193 01.1	58.4	119 35.3	49.8	307 10.0	28.0	209 06.6	14.6	165 11.8	106	24 27.8	+ 14
	3	83 53.1	208 04.1	·· 58.2	134 36.0	·· 49.4	322 12.3	·· 27.9	224 08.8	·· 14.7	179 41.4	106	·24 26.4	+ 14
	4	98 55.5	223 07.2	57.9	149 36.8	48.9	337 14.6	27.9	239 11.0	14.8	194 11.0	106	24 25.0	+ 16
	5	113 58.0	238 10.2	57.6	164 37.5	48.4	352 17.0	27.9	254 13.2	14.9	208 40.6	106	24 23.4	+ 17
	6	129 00.5	253 13.2	−25 57.3	179 38.3	−20 47.9	7 19.3	+20 27.9	269 15.3	−13 15.0	223 10.2	106	−24 21.7	+ 18
	7	144 02.9	268 16.2	57.0	194 39.1	47.4	22 21.6	27.9	284 17.5	15.1	237 39.8	106	24 19.9	+ 19
	8	159 05.4	283 19.2	56.7	209 39.8	46.9	37 23.9	27.8	299 19.7	15.2	252 09.4	106	24 18.0	+ 21
	9	174 07.9	298 22.3	·· 56.4	224 40.6	·· 46.4	52 26.3	·· 27.8	314 21.8	·· 15.3	266 39.0	106	·24 15.9	+ 21
	10	189 10.3	313 25.3	56.1	239 41.3	45.9	67 28.6	27.8	329 24.0	15.4	281 08.6	106	24 13.8	+ 23
	11	204 12.8	328 28.3	55.8	254 42.1	45.4	82 30.9	27.8	344 26.2	15.4	295 38.2	106	24 11.5	+ 24
	12	219 15.3	343 31.4	−25 55.5	269 42.9	−20 44.9	97 33.2	+20 27.8	359 28.4	−13 15.5	310 07.8	106	−24 09.1	+ 26
	13	234 17.7	358 34.4	55.1	284 43.6	44.4	112 35.5	27.7	14 30.5	15.6	324 37.4	106	24 06.5	+ 26
	14	249 20.2	13 37.5	54.8	299 44.4	43.9	127 37.9	27.7	29 32.7	15.7	339 07.0	107	24 03.9	+ 28
	15	264 22.6	28 40.6	·· 54.5	314 45.1	·· 43.4	142 40.2	·· 27.7	44 34.9	·· 15.8	353 36.7	106	·24 01.1	+ 29
	16	279 25.1	43 43.6	54.2	329 45.9	42.9	157 42.5	27.7	59 37.0	15.9	8 06.3	106	23 58.2	+ 30
	17	294 27.6	58 46.7	53.9	344 46.6	42.4	172 44.8	27.6	74 39.2	16.0	22 35.9	107	23 55.2	+ 31
	18	309 30.0	73 49.8	−25 53.6	359 47.4	−20 41.9	187 47.2	+20 27.6	89 41.4	−13 16.1	37 05.6	106	−23 52.1	+ 32
	19	324 32.5	88 52.8	53.2	14 48.2	41.4	202 49.5	27.6	104 43.6	16.2	51 35.2	107	23 48.9	+ 34
	20	339 35.0	103 55.9	52.9	29 48.9	40.9	217 51.8	27.6	119 45.7	16.3	66 04.9	106	23 45.5	+ 34
	21	354 37.4	118 59.0	·· 52.6	44 49.7	·· 40.4	232 54.1	·· 27.6	134 47.9	·· 16.4	80 34.5	107	·23 42.1	+ 36
	22	9 39.9	134 02.1	52.3	59 50.4	39.9	247 56.5	27.5	149 50.1	16.5	95 04.2	107	23 38.5	+ 37
	23	24 42.4	149 05.2	51.9	74 51.2	39.4	262 58.8	27.5	164 52.2	16.6	109 33.9	107	23 34.8	+ 39
1	0	39 44.8	164 08.3	−25 51.6	89 51.9	−20 38.9	278 01.1	+20 27.5	179 54.4	−13 16.7	124 03.6	107	−23 30.9	+ 39
	1	54 47.3	179 11.4	51.3	104 52.7	38.4	293 03.5	27.5	194 56.6	16.8	138 33.3	107	23 27.0	+ 40
	2	69 49.8	194 14.5	50.9	119 53.5	37.9	308 05.8	27.5	209 58.8	16.8	153 03.0	108	23 23.0	+ 42
	3	84 52.2	209 17.6	·· 50.6	134 54.2	·· 37.4	323 08.1	·· 27.4	225 00.9	·· 16.9	167 32.8	107	·23 18.8	+ 43
	4	99 54.7	224 20.7	50.2	149 55.0	36.9	338 10.4	27.4	240 03.1	17.0	182 02.5	108	23 14.5	+ 44
	5	114 57.1	239 23.8	49.9	164 55.7	36.4	353 12.8	27.4	255 05.3	17.1	196 32.3	108	23 10.1	+ 45
	6	129 59.6	254 26.9	−25 49.6	179 56.5	−20 35.9	8 15.1	+20 27.4	270 07.4	−13 17.2	211 02.1	108	−23 05.6	+ 47
	7	145 02.1	269 30.0	49.2	194 57.2	35.4	23 17.4	27.4	285 09.6	17.3	225 31.9	108	23 00.9	+ 47
	8	160 04.5	284 33.2	48.9	209 58.0	34.9	38 19.8	27.3	300 11.8	17.4	240 01.7	108	22 56.2	+ 49
	9	175 07.0	299 36.3	·· 48.5	224 58.8	·· 34.4	53 22.1	·· 27.3	315 13.9	·· 17.5	254 31.5	108	·22 51.3	+ 50
	10	190 09.5	314 39.4	48.1	239 59.5	33.9	68 24.4	27.3	330 16.1	17.6	269 01.3	109	22 46.3	+ 51
	11	205 11.9	329 42.6	47.8	255 00.3	33.4	83 26.8	27.3	345 18.3	17.7	283 31.2	109	22 41.2	+ 52
	12	220 14.4	344 45.7	−25 47.4	270 01.0	−20 32.9	98 29.1	+20 27.3	0 20.5	−13 17.8	298 01.1	109	−22 36.0	+ 53
	13	235 16.9	359 48.9	47.1	285 01.8	32.4	113 31.4	27.2	15 22.6	17.9	312 31.0	109	22 30.7	+ 54
	14	250 19.3	14 52.0	46.7	300 02.5	31.9	128 33.7	27.2	30 24.8	18.0	327 00.9	109	22 25.3	+ 56
	15	265 21.8	29 55.2	·· 46.3	315 03.3	·· 31.4	143 36.1	·· 27.2	45 27.0	·· 18.1	341 30.8	110	·22 19.7	+ 56
	16	280 24.3	44 58.3	46.0	330 04.1	30.9	158 38.4	27.2	60 29.1	18.1	356 00.8	109	22 14.1	+ 58
	17	295 26.7	60 01.5	45.6	345 04.8	30.4	173 40.7	27.2	75 31.3	18.2	10 30.7	110	22 08.3	+ 59
	18	310 29.2	75 04.7	−25 45.2	0 05.6	−20 29.9	188 43.1	+20 27.1	90 33.5	−13 18.3	25 00.7	110	−22 02.4	+ 60
	19	325 31.6	90 07.8	44.9	15 06.3	29.4	203 45.4	27.1	105 35.7	18.4	39 30.7	111	21 56.4	+ 61
	20	340 34.1	105 11.0	44.5	30 07.1	28.9	218 47.7	27.1	120 37.8	18.5	54 00.8	110	21 50.3	+ 62
	21	355 36.6	120 14.2	·· 44.1	45 07.8	·· 28.4	233 50.1	·· 27.1	135 40.0	·· 18.6	68 30.8	111	·21 44.1	+ 63
	22	10 39.0	135 17.4	43.7	60 08.6	27.9	248 52.4	27.1	150 42.2	18.7	83 00.9	111	21 37.8	+ 65
	23	25 41.5	150 20.6	43.4	75 09.3	27.4	263 54.8	27.0	165 44.3	18.8	97 31.0	111	21 31.3	+ 65
2	0	40 44.0	165 23.8	−25 43.0	90 10.1	−20 26.9	278 57.1	+20 27.0	180 46.5	−13 18.9	112 01.1	111	−21 24.8	+ 67
	1	55 46.4	180 27.0	42.6	105 10.9	26.4	293 59.4	27.0	195 48.7	19.0	126 31.2	112	21 18.1	+ 68
	2	70 48.9	195 30.2	42.2	120 11.6	25.9	309 01.8	27.0	210 50.9	19.1	141 01.4	111	21 11.3	+ 68
	3	85 51.4	210 33.4	·· 41.8	135 12.4	·· 25.4	324 04.1	·· 27.0	225 53.0	·· 19.2	155 31.5	112	·21 04.5	+ 70
	4	100 53.8	225 36.6	41.4	150 13.1	24.9	339 06.4	26.9	240 55.2	19.3	170 01.7	112	20 57.5	+ 71
	5	115 56.3	240 39.8	41.0	165 13.9	24.4	354 08.8	26.9	255 57.4	19.3	184 31.9	113	20 50.4	+ 72
	6	130 58.7	255 43.0	−25 40.6	180 14.6	−20 23.9	9 11.1	+20 26.9	270 59.5	−13 19.4	199 02.2	113	−20 43.2	+ 73
	7	146 01.2	270 46.2	40.2	195 15.4	23.3	24 13.4	26.9	286 01.7	19.5	213 32.5	112	20 35.9	+ 74
	8	161 03.7	285 49.4	39.8	210 16.2	22.8	39 15.8	26.9	301 03.9	19.6	228 02.7	113	20 28.5	+ 75
	9	176 06.1	300 52.7	·· 39.4	225 16.9	·· 22.3	54 18.1	·· 26.9	316 06.1	·· 19.7	242 33.0	114	·20 21.0	+ 76
	10	191 08.6	315 55.9	39.0	240 17.7	21.8	69 20.5	26.8	331 08.2	19.8	257 03.4	113	20 13.4	+ 78
	11	206 11.1	330 59.1	38.6	255 18.4	21.3	84 22.8	26.8	346 10.4	19.9	271 33.7	114	20 05.6	+ 78
	12	221 13.5	346 02.4	−25 38.2	270 19.2	−20 20.8	99 25.1	+20 26.8	1 12.6	−13 20.0	286 04.1	114	−19 57.8	+ 79
	13	236 16.0	1 05.6	37.8	285 19.9	20.3	114 27.5	26.8	16 14.7	20.1	300 34.5	114	19 49.9	+ 81
	14	251 18.5	16 08.9	37.4	300 20.7	19.8	129 29.8	26.8	31 16.9	20.2	315 04.9	115	19 41.8	+ 81
	15	266 20.9	31 12.1	·· 37.0	315 21.4	·· 19.3	144 32.2	·· 26.7	46 19.1	·· 20.3	329 35.4	115	·19 33.7	+ 82
	16	281 23.4	46 15.4	36.5	330 22.2	18.8	159 34.5	26.7	61 21.3	20.4	344 05.9	114	19 25.5	+ 84
	17	296 25.9	61 18.6	36.1	345 23.0	18.3	174 36.8	26.7	76 23.4	20.5	358 36.3	116	19 17.1	+ 84
	18	311 28.3	76 21.9	−25 35.7	0 23.7	−20 17.7	189 39.2	+20 26.7	91 25.6	−13 20.6	13 06.9	115	−19 08.7	+ 86
	19	326 30.8	91 25.2	35.3	15 24.5	17.2	204 41.5	26.7	106 27.8	20.6	27 37.4	115	19 00.1	+ 86
	20	341 33.2	106 28.4	34.8	30 25.2	16.7	219 43.9	26.7	121 29.9	20.7	42 07.9	116	18 51.5	+ 88
	21	356 35.7	121 31.7	·· 34.4	45 26.0	·· 16.2	234 46.2	·· 26.6	136 32.1	·· 20.8	56 38.5	116	·18 42.7	+ 88
	22	11 38.2	136 35.0	34.0	60 26.7	15.7	249 48.5	26.6	151 34.3	20.9	71 09.1	117	18 33.9	+ 89
	23	26 40.6	151 38.3	33.6	75 27.5	15.2	264 50.9	26.6	166 36.4	21.0	85 39.8	116	18 25.0	+ 91
	24	41 43.1	166 41.6	−25 33.1	90 28.2	−20 14.7	279 53.2	+20 26.6	181 38.6	−13 21.1	100 10.4	117	−18 15.9	+ 91
code		−	+ 32	+ 3	+ 8	+ 5	+ 23	− 1	+ 21	− 1				

SUN

Day	GMT h	GHA ° ′	Dec. ° ′
31	0	184 04.4	-13 51.9
	1	199 04.4	52.7
	2	214 04.4	53.5
	3	229 04.4	•• 54.3
	4	244 04.5	55.1
	5	259 04.5	56.0
	6	274 04.5	-13 56.8
	7	289 04.6	57.6
	8	304 04.6	58.4
	9	319 04.6	-13 59.2
	10	334 04.6	14 00.0
	11	349 04.7	00.9
	12	4 04.7	-14 01.7
	13	19 04.7	02.5
	14	34 04.7	03.3
	15	49 04.8	•• 04.1
	16	64 04.8	04.9
	17	79 04.8	05.7
	18	94 04.8	-14 06.5
	19	109 04.9	07.4
	20	124 04.9	08.2
	21	139 04.9	•• 09.0
	22	154 04.9	09.8
	23	169 05.0	10.6
1	0	184 05.0	-14 11.4
	1	199 05.0	12.2
	2	214 05.0	13.0
	3	229 05.0	•• 13.8
	4	244 05.1	14.6
	5	259 05.1	15.4
	6	274 05.1	-14 16.2
	7	289 05.1	17.0
	8	304 05.1	17.9
	9	319 05.2	•• 18.7
	10	334 05.2	19.5
	11	349 05.2	20.3
	12	4 05.2	-14 21.1
	13	19 05.2	21.9
	14	34 05.3	22.7
	15	49 05.3	•• 23.5
	16	64 05.3	24.3
	17	79 05.3	25.1
	18	94 05.3	-14 25.9
	19	109 05.3	26.7
	20	124 05.4	27.5
	21	139 05.4	•• 28.3
	22	154 05.4	29.1
	23	169 05.4	29.9
2	0	184 05.4	-14 30.7
	1	199 05.4	31.5
	2	214 05.4	32.3
	3	229 05.5	•• 33.1
	4	244 05.5	33.9
	5	259 05.5	34.7
	6	274 05.5	-14 35.5
	7	289 05.5	36.3
	8	304 05.5	37.1
	9	319 05.5	•• 37.9
	10	334 05.5	38.7
	11	349 05.6	39.5
	12	4 05.6	-14 40.2
	13	19 05.6	41.0
	14	34 05.6	41.8
	15	49 05.6	•• 42.6
	16	64 05.6	43.4
	17	79 05.6	44.2
	18	94 05.6	-14 45.0
	19	109 05.6	45.8
	20	124 05.6	46.6
	21	139 05.6	•• 47.4
	22	154 05.6	48.2
	23	169 05.7	49.0
	24	184 05.7	-14 49.7
code		—	- 8

STARS

No.	Name	SHA ° ′	Dec. ° ′
7	Acamar	315 51.2	-40 28.9
5	Achernar	335 58.7	-57 27.9
30	Acrux	173 59.3	-62 50.8
19	Adhara	255 46.9	-28 54.3
10	Aldebaran	291 39.5	+16 25.3
32	Alioth	166 59.6	+56 12.1
34	Alkaid	153 33.8	+49 32.2
55	Al Na'ir	28 38.6	-47 10.9
15	Alnilam	276 30.7	- 1 13.6
25	Alphard	218 39.3	- 8 27.6
41	Alphecca	126 48.5	+26 52.0
1	Alpheratz	358 28.8	+28 50.8
51	Altair	62 51.2	+ 8 45.0
2	Ankaa	353 58.5	-42 33.0
42	Antares	113 20.5	-26 20.0
37	Arcturus	146 36.1	+19 25.0
43	Atria	109 02.4	-68 57.0
22	Avior	234 36.1	-59 21.5
13	Bellatrix	279 18.9	+ 6 18.7
16	Betelg'se	271 48.6	+ 7 24.1
17	Canopus	264 15.4	-52 39.9
12	Capella	281 39.1	+45 57.2
53	Deneb	50 01.5	+45 07.4
28	Denebola	183 18.6	+14 49.4
4	Diphda	349 39.6	-18 13.9
27	Dubhe	194 45.7	+61 59.4
14	Elnath	279 07.9	+28 34.3
47	Eltanin	91 06.9	+51 29.8
54	Enif	34 30.2	+ 9 40.3
56	Fomalhaut	16 12.1	-29 51.7
31	Gacrux	172 50.6	-56 51.5
29	Gienah	176 37.8	-17 17.4
35	Hadar	149 51.1	-60 09.4
6	Hamal	328 50.1	+23 15.2
48	Kaus Aust.	84 42.3	-34 24.6
40	Kochab	137 18.9	+74 20.4
57	Markab	14 22.0	+14 58.0
8	Menkar	315 00.7	+ 3 55.0
36	Menkent	148 59.9	-36 08.9
24	Miapl'dus	221 49.4	-69 31.6
9	Mirfak	309 42.9	+49 42.2
50	Nunki	76 52.9	-26 21.3
52	Peacock	54 28.4	-56 53.1
21	Pollux	244 21.3	+28 08.1
20	Procyon	245 45.6	+ 5 20.6
46	R'alhague	96 47.5	+12 35.6
26	Regulus	208 30.3	+12 11.3
11	Rigel	281 54.0	- 8 15.0
38	Rigil Kent.	140 52.7	-60 39.1
44	Sabik	103 03.2	-15 40.2
3	Schedar	350 30.3	+56 17.7
45	Shaula	97 21.9	-37 04.5
18	Sirius	259 12.3	-16 39.0
33	Spica	159 17.9	-10 55.5
23	Suhail	223 24.9	-43 14.7
49	Vega	81 09.0	+38 44.7
39	Zub'g'bi	137 54.5	-15 51.3

Sunrise, Twilight, Moonrise

Lat. °	Sunrise h m	Twlt. begins h m	Moonrise 31 h m	Moonrise 1 h m	Moonrise 2 h m	Moonrise 3 h m
N 72	8 54	4 43	■	■	■	15 52
70	8 28	4 47	■	■	16 10	15 15
68	8 09	4 50	■	■	15 10	14 48
66	7 53	4 52	■	14 46	14 35	14 28
64	7 41	4 54	13 51	14 05	14 10	14 12
62	7 30	4 55	13 13	13 37	13 50	13 58
60	7 21	4 56	12 46	13 15	13 34	13 47
58	7 13	4 57	12 25	12 57	13 20	13 37
56	7 06	4 58	12 08	12 42	13 08	13 28
54	7 00	4 58	11 53	12 29	12 58	13 20
52	6 54	4 58	11 40	12 18	12 48	13 13
50	6 49	4 58	11 29	12 08	12 40	13 06
45	6 38	4 57	11 05	11 47	12 22	12 53
40	6 28	4 56	10 46	11 30	12 08	12 41
35	6 20	4 55	10 30	11 15	11 55	12 31
30	6 13	4 52	10 17	11 02	11 44	12 23
20	6 01	4 46	9 53	10 41	11 26	12 08
10	5 50	4 39	9 33	10 22	11 09	11 55
0	5 40	4 29	9 14	10 05	10 54	11 43
10	5 30	4 17	8 55	9 47	10 39	11 30
20	5 19	4 02	8 35	9 28	10 22	11 17
30	5 06	3 41	8 12	9 06	10 03	11 02
35	4 58	3 26	7 58	8 54	9 52	10 53
40	4 50	3 09	7 42	8 39	9 39	10 43
45	4 40	2 46	7 23	8 21	9 25	10 31
50	4 28	2 13	7 00	7 59	9 06	10 17
52	4 22	1 56	6 48	7 49	8 57	10 10
54	4 16	1 34	6 35	7 37	8 47	10 03
56	4 09	1 02	6 21	7 24	8 36	9 54
58	4 01	////	6 03	7 08	8 23	9 44
60	3 52	////	5 41	6 49	8 08	9 34
S						

Sunset, Twilight, Moonset

Lat. °	Sunset h m	Twlt. ends h m	Moonset 31 h m	Moonset 1 h m	Moonset 2 h m	Moonset 3 h m
N 72	14 32	18 39	■	■	■	20 17
70	14 58	18 36	■	■	18 15	20 52
68	15 17	18 33	■	■	19 14	21 17
66	15 33	18 31	■	17 55	19 49	21 36
64	15 45	18 29	17 06	18 36	20 13	21 52
62	15 56	18 28	17 44	19 04	20 32	22 04
60	16 05	18 27	18 11	19 25	20 48	22 15
58	16 13	18 27	18 32	19 42	21 01	22 24
56	16 20	18 27	18 49	19 57	21 13	22 32
54	16 27	18 27	19 03	20 10	21 23	22 39
52	16 33	18 27	19 16	20 21	21 31	22 46
50	16 38	18 27	19 27	20 30	21 39	22 52
45	16 49	18 28	19 50	20 51	21 56	23 04
40	16 58	18 30	20 09	21 07	22 10	23 14
35	17 06	18 32	20 24	21 21	22 21	23 23
30	17 13	18 34	20 38	21 34	22 31	23 31
20	17 26	18 41	21 00	21 54	22 49	23 44
10	17 37	18 49	21 20	22 12	23 04	23 55
0	17 47	18 58	21 39	22 28	23 17	24 06
10	17 57	19 10	21 57	22 45	23 31	24 16
20	18 09	19 27	22 16	23 02	23 46	24 27
30	18 22	19 48	22 39	23 23	24 03	0 03
35	18 29	20 02	22 52	23 34	24 12	0 12
40	18 38	20 21	23 07	23 48	24 23	0 23
45	18 48	20 44	23 25	24 04	0 04	0 36
50	19 01	21 18	23 48	24 23	0 23	0 52
52	19 06	21 35	23 58	24 32	0 32	0 59
54	19 13	21 59	24 10	0 10	0 43	1 07
56	19 20	22 34	24 24	0 24	0 54	1 16
58	19 28	////	0 02	0 40	1 07	1 27
60	19 37	////	0 23	0 59	1 23	1 38
S						

Equation of Time (App.—Mean)

GMT h	31 m s	1 m s	2 m s
0	+16 17.4	+16 19.9	+16 21.7
6	+16 18.1	+16 20.4	+16 22.0
12	+16 18.7	+16 20.9	+16 22.2
18	+16 19.3	+16 21.3	+16 22.4
24	+16 19.9	+16 21.7	+16 22.6

GMT of Transit, Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
31	15 27	13 06	18 01	5 31	12 02
1	16 17	13 01	18 00	5 27	11 59
2	17 06	12 56	17 58	5 23	11 55
3	17 54	12 50	17 57	5 20	11 52

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0			
	0.4	0.5	0.1
30			
	0.4	0.4	0.1
45			
	0.4	0.3	0.1
60			
	0.4	0.2	0.1
75			
	0.4	0.1	0.0
90			

Moon's Lower Limb Add

Alt. °	31 ′	1 ′	2 ′
0			
	12.5	13.1	13.9
4			
	12.5	13.1	13.9
8			
	12.5	13.2	13.9
12			
	12.6	13.2	13.9
16			
	12.6	13.2	14.0
20			
	12.7	13.3	14.0
24			
	12.7	13.3	14.0
28			
	12.8	13.4	14.1
32			
	12.9	13.5	14.1
36			
	13.0	13.5	14.2
40			
	13.1	13.6	14.2
44			
	13.2	13.7	14.3
48			
	13.4	13.8	14.4
52			
	13.5	13.9	14.4
56			
	13.6	14.0	14.5
60			
	13.8	14.1	14.6
64			
	13.9	14.3	14.7
68			
	14.1	14.4	14.8
72			
	14.2	14.5	14.8
76			
	14.4	14.6	14.9
80			
	14.6	14.8	15.0
84			
	14.7	14.9	15.1
88			
	14.9	15.0	15.2
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt. °	31 ′	1 ′	2 ′
0			
	17.3	16.9	16.5
4			
	17.3	16.9	16.5
8			
	17.3	16.9	16.5
12			
	17.2	16.9	16.5
16			
	17.2	16.8	16.4
20			
	17.1	16.8	16.4
24			
	17.1	16.7	16.4
28			
	17.0	16.7	16.3
32			
	16.9	16.6	16.3
36			
	16.8	16.5	16.2
40			
	16.7	16.4	16.2
44			
	16.6	16.4	16.1
48			
	16.4	16.3	16.0
52			
	16.3	16.2	16.0
56			
	16.2	16.0	15.9
60			
	16.0	15.9	15.8
64			
	15.9	15.8	15.7
68			
	15.7	15.7	15.6
72			
	15.6	15.6	15.6
76			
	15.4	15.4	15.5
80			
	15.2	15.3	15.4
84			
	15.1	15.2	15.3
88			
	14.9	15.1	15.2
90			

Subtract from table, back cover

Election Day (in certain States) 2

G M T		♈ GHA	VENUS −3.8 GHA	VENUS Dec.	MARS 0.1 GHA	MARS Dec.	JUPITER −1.9 GHA	JUPITER Dec.	SATURN 0.7 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
3	0	41 43.1	166 41.6	−25 33.1	90 28.2	−20 14.7	279 53.2	+20 26.6	181 38.6	−13 21.1	100 10.4	117	−18 15.9	+ 91
	1	56 45.6	181 44.9	32.7	105 29.0	14.2	294 55.6	26.6	196 40.8	21.2	114 41.1	117	18 06.8	+ 93
	2	71 48.0	196 48.2	32.2	120 29.8	13.6	309 57.9	26.5	211 43.0	21.3	129 11.8	117	17 57.5	+ 93
	3	86 50.5	211 51.5	·· 31.8	135 30.5	·· 13.1	325 00.3	·· 26.5	226 45.1	·· 21.4	143 42.5	117	·17 48.2	+ 94
	4	101 53.0	226 54.8	31.4	150 31.3	12.6	340 02.6	26.5	241 47.3	21.5	158 13.2	118	17 38.8	+ 95
	5	116 55.4	241 58.1	30.9	165 32.0	12.1	355 05.0	26.5	256 49.5	21.6	172 44.0	117	17 29.3	+ 96
	6	131 57.9	257 01.4	−25 30.5	180 32.8	−20 11.6	10 07.3	+20 26.5	271 51.6	−13 21.7	187 14.7	118	−17 19.7	+ 98
	7	147 00.4	272 04.7	30.0	195 33.5	11.1	25 09.6	26.5	286 53.8	21.8	201 45.5	118	17 09.9	+ 98
	8	162 02.8	287 08.0	29.6	210 34.3	10.6	40 12.0	26.4	301 56.0	21.8	216 16.3	119	17 00.1	+ 99
	9	177 05.3	302 11.3	·· 29.1	225 35.0	·· 10.0	55 14.3	·· 26.4	316 58.2	·· 21.9	230 47.2	118	·16 50.2	+ 99
	10	192 07.7	317 14.7	28.7	240 35.8	09.5	70 16.7	26.4	332 00.3	22.0	245 18.0	119	16 40.3	+101
	11	207 10.2	332 18.0	28.2	255 36.6	09.0	85 19.0	26.4	347 02.5	22.1	259 48.9	119	16 30.2	+102
	12	222 12.7	347 21.3	−25 27.7	270 37.3	−20 08.5	100 21.4	+20 26.4	2 04.7	−13 22.2	274 19.8	119	−16 20.0	+102
	13	237 15.1	2 24.7	27.3	285 38.1	08.0	115 23.7	26.4	17 06.8	22.3	288 50.7	119	16 09.8	+104
	14	252 17.6	17 28.0	26.8	300 38.8	07.5	130 26.1	26.3	32 09.0	22.4	303 21.6	119	15 59.4	+104
	15	267 20.1	32 31.3	·· 26.3	315 39.6	·· 06.9	145 28.4	·· 26.3	47 11.2	·· 22.5	317 52.5	120	·15 49.0	+106
	16	282 22.5	47 34.7	25.9	330 40.3	06.4	160 30.8	26.3	62 13.3	22.6	332 23.5	120	15 38.4	+106
	17	297 25.0	62 38.0	25.4	345 41.1	05.9	175 33.1	26.3	77 15.5	22.7	346 54.5	120	15 27.8	+107
	18	312 27.5	77 41.4	−25 24.9	0 41.8	−20 05.4	190 35.5	+20 26.3	92 17.7	−13 22.8	1 25.5	120	−15 17.1	+108
	19	327 29.9	92 44.8	24.5	15 42.6	04.9	205 37.8	26.3	107 19.9	22.9	15 56.5	120	15 06.3	+108
	20	342 32.4	107 48.1	24.0	30 43.3	04.4	220 40.2	26.2	122 22.0	23.0	30 27.5	120	14 55.5	+110
	21	357 34.9	122 51.5	·· 23.5	45 44.1	·· 03.8	235 42.5	·· 26.2	137 24.2	·· 23.0	44 58.5	121	·14 44.5	+110
	22	12 37.3	137 54.9	23.0	60 44.9	03.3	250 44.9	26.2	152 26.4	23.1	59 29.6	120	14 33.5	+112
	23	27 39.8	152 58.2	22.5	75 45.6	02.8	265 47.2	26.2	167 28.5	23.2	74 00.6	121	14 22.3	+112
4	0	42 42.2	168 01.6	−25 22.0	90 46.4	−20 02.3	280 49.6	+20 26.2	182 30.7	−13 23.3	88 31.7	121	−14 11.1	+113
	1	57 44.7	183 05.0	21.6	105 47.1	01.8	295 51.9	26.2	197 32.9	23.4	103 02.8	121	13 59.8	+113
	2	72 47.2	198 08.4	21.1	120 47.9	01.2	310 54.3	26.1	212 35.1	23.5	117 33.9	121	13 48.5	+115
	3	87 49.6	213 11.8	·· 20.6	135 48.6	·· 00.7	325 56.6	·· 26.1	227 37.2	·· 23.6	132 05.0	121	·13 37.0	+115
	4	102 52.1	228 15.2	20.1	150 49.4	20 00.2	340 59.0	26.1	242 39.4	23.7	146 36.1	122	13 25.5	+116
	5	117 54.6	243 18.6	19.6	165 50.1	19 59.7	356 01.3	26.1	257 41.6	23.8	161 07.3	121	13 13.9	+117
	6	132 57.0	258 22.0	−25 19.1	180 50.9	−19 59.2	11 03.7	+20 26.1	272 43.7	−13 23.9	175 38.4	122	−13 02.2	+118
	7	147 59.5	273 25.4	18.6	195 51.6	58.6	26 06.1	26.1	287 45.9	24.0	190 09.6	121	12 50.4	+118
	8	163 02.0	288 28.8	18.1	210 52.4	58.1	41 08.4	26.1	302 48.1	24.1	204 40.7	122	12 38.6	+120
	9	178 04.4	303 32.2	·· 17.6	225 53.2	·· 57.6	56 10.8	·· 26.0	317 50.2	·· 24.2	219 11.9	122	·12 26.6	+120
	10	193 06.9	318 35.6	17.1	240 53.9	57.1	71 13.1	26.0	332 52.4	24.2	233 43.1	121	12 14.6	+120
	11	208 09.4	333 39.0	16.6	255 54.7	56.6	86 15.5	26.0	347 54.6	24.3	248 14.2	122	12 02.6	+122
	12	223 11.8	348 42.4	−25 16.0	270 55.4	−19 56.0	101 17.8	+20 26.0	2 56.8	−13 24.4	262 45.4	122	−11 50.4	+122
	13	238 14.3	3 45.9	15.5	285 56.2	55.5	116 20.2	26.0	17 58.9	24.5	277 16.6	122	11 38.2	+123
	14	253 16.7	18 49.3	15.0	300 56.9	55.0	131 22.5	26.0	33 01.1	24.6	291 47.8	122	11 25.9	+124
	15	268 19.2	33 52.7	·· 14.5	315 57.7	·· 54.5	146 24.9	·· 25.9	48 03.3	·· 24.7	306 19.0	122	·11 13.5	+124
	16	283 21.7	48 56.2	14.0	330 58.4	53.9	161 27.3	25.9	63 05.4	24.8	320 50.2	122	11 01.1	+125
	17	298 24.1	63 59.6	13.4	345 59.2	53.4	176 29.6	25.9	78 07.6	24.9	335 21.4	122	10 48.6	+126
	18	313 26.6	79 03.0	−25 12.9	0 59.9	−19 52.9	191 32.0	+20 25.9	93 09.8	−13 25.0	349 52.6	122	−10 36.0	+126
	19	328 29.1	94 06.5	12.4	16 00.7	52.4	206 34.3	25.9	108 11.9	25.1	4 23.8	122	10 23.4	+127
	20	343 31.5	109 09.9	11.9	31 01.5	51.8	221 36.7	25.9	123 14.1	25.2	18 55.0	122	10 10.7	+128
	21	358 34.0	124 13.4	·· 11.3	46 02.2	·· 51.3	236 39.0	·· 25.9	138 16.3	·· 25.3	33 26.2	122	· 9 57.9	+128
	22	13 36.5	139 16.9	10.8	61 03.0	50.8	251 41.4	25.8	153 18.5	25.4	47 57.4	122	9 45.1	+130
	23	28 38.9	154 20.3	10.3	76 03.7	50.3	266 43.8	25.8	168 20.6	25.4	62 28.6	122	9 32.1	+129
5	0	43 41.4	169 23.8	−25 09.7	91 04.5	−19 49.7	281 46.1	+20 25.8	183 22.8	−13 25.5	76 59.8	122	− 9 19.2	+131
	1	58 43.8	184 27.2	09.2	106 05.2	49.2	296 48.5	25.8	198 25.0	25.6	91 31.0	121	9 06.1	+131
	2	73 46.3	199 30.7	08.6	121 06.0	48.7	311 50.8	25.8	213 27.1	25.7	106 02.1	122	8 53.0	+131
	3	88 48.8	214 34.2	·· 08.1	136 06.7	·· 48.2	326 53.2	·· 25.8	228 29.3	·· 25.8	120 33.3	122	· 8 39.9	+133
	4	103 51.2	229 37.7	07.6	151 07.5	47.6	341 55.6	25.8	243 31.5	25.9	135 04.5	121	8 26.6	+132
	5	118 53.7	244 41.2	07.0	166 08.2	47.1	356 57.9	25.7	258 33.6	26.0	149 35.6	122	8 13.4	+134
	6	133 56.2	259 44.6	−25 06.5	181 09.0	−19 46.6	12 00.3	+20 25.7	273 35.8	−13 26.1	164 06.8	121	− 8 00.0	+134
	7	148 58.6	274 48.1	05.9	196 09.8	46.0	27 02.7	25.7	288 38.0	26.2	178 37.9	121	7 46.6	+134
	8	164 01.1	289 51.6	05.3	211 10.5	45.5	42 05.0	25.7	303 40.2	26.3	193 09.0	122	7 33.2	+136
	9	179 03.6	304 55.1	·· 04.8	226 11.3	·· 45.0	57 07.4	·· 25.7	318 42.3	·· 26.4	207 40.2	121	· 7 19.6	+135
	10	194 06.0	319 58.6	04.2	241 12.0	44.5	72 09.7	25.7	333 44.5	26.5	222 11.3	120	7 06.1	+136
	11	209 08.5	335 02.1	03.7	256 12.8	43.9	87 12.1	25.7	348 46.7	26.5	236 42.3	121	6 52.5	+137
	12	224 11.0	350 05.6	−25 03.1	271 13.5	−19 43.4	102 14.5	+20 25.7	3 48.8	−13 26.6	251 13.4	121	− 6 38.8	+138
	13	239 13.4	5 09.1	02.5	286 14.3	42.9	117 16.8	25.6	18 51.0	26.7	265 44.5	120	6 25.0	+137
	14	254 15.9	20 12.6	02.0	301 15.0	42.3	132 19.2	25.6	33 53.2	26.8	280 15.5	120	6 11.3	+139
	15	269 18.3	35 16.1	·· 01.4	316 15.8	·· 41.8	147 21.6	·· 25.6	48 55.4	·· 26.9	294 46.5	121	· 5 57.4	+138
	16	284 20.8	50 19.7	00.8	331 16.5	41.3	162 23.9	25.6	63 57.5	27.0	309 17.6	119	5 43.6	+140
	17	299 23.3	65 23.2	25 00.3	346 17.3	40.7	177 26.3	25.6	78 59.7	27.1	323 48.5	120	5 29.6	+139
	18	314 25.7	80 26.7	−24 59.7	1 18.1	−19 40.2	192 28.7	+20 25.6	94 01.9	−13 27.2	338 19.5	120	− 5 15.7	+141
	19	329 28.2	95 30.2	59.1	16 18.8	39.7	207 31.0	25.6	109 04.0	27.3	352 50.5	119	5 01.6	+140
	20	344 30.7	110 33.8	58.5	31 19.6	39.2	222 33.4	25.5	124 06.2	27.4	7 21.4	119	4 47.6	+141
	21	359 33.1	125 37.3	·· 57.9	46 20.3	·· 38.6	237 35.8	·· 25.5	139 08.4	·· 27.5	21 52.3	118	· 4 33.5	+142
	22	14 35.6	140 40.8	57.4	61 21.1	38.1	252 38.1	25.5	154 10.5	27.6	36 23.1	119	4 19.3	+142
	23	29 38.1	155 44.4	56.8	76 21.8	37.6	267 40.5	25.5	169 12.7	27.6	50 54.0	118	4 05.1	+142
	24	44 40.5	170 47.9	−24 56.2	91 22.6	−19 37.0	282 42.9	+20 25.5	184 14.9	−13 27.7	65 24.8	118	− 3 50.9	+143
code		–	+ 35	+ 5	+ 8	+ 5	+ 24	0	+ 21	− 1				

Day	GMT h	SUN GHA ° ′	SUN Dec. ° ′
3	0	184 05.7	−14 49.7
	1	199 05.7	50.5
	2	214 05.7	51.3
	3	229 05.7	·· 52.1
	4	244 05.7	52.9
	5	259 05.7	53.7
	6	274 05.7	−14 54.5
	7	289 05.7	55.3
	8	304 05.7	56.0
	9	319 05.7	·· 56.8
	10	334 05.7	57.6
	11	349 05.7	58.4
	12	4 05.7	−14 59.2
	13	19 05.7	15 00.0
	14	34 05.7	00.7
	15	49 05.7	·· 01.5
	16	64 05.7	02.3
	17	79 05.7	03.1
	18	94 05.7	−15 03.9
	19	109 05.7	04.7
	20	124 05.7	05.4
	21	139 05.7	·· 06.2
	22	154 05.7	07.0
	23	169 05.7	07.8
4	0	184 05.7	−15 08.6
	1	199 05.7	09.3
	2	214 05.7	10.1
	3	229 05.7	·· 10.9
	4	244 05.7	11.7
	5	259 05.7	12.4
	6	274 05.7	−15 13.2
	7	289 05.7	14.0
	8	304 05.7	14.8
	9	319 05.7	·· 15.5
	10	334 05.7	16.3
	11	349 05.6	17.1
	12	4 05.6	−15 17.9
	13	19 05.6	18.6
	14	34 05.6	19.4
	15	49 05.6	·· 20.2
	16	64 05.6	21.0
	17	79 05.6	21.7
	18	94 05.6	−15 22.5
	19	109 05.6	23.3
	20	124 05.6	24.0
	21	139 05.6	·· 24.8
	22	154 05.6	25.6
	23	169 05.5	26.4
5	0	184 05.5	−15 27.1
	1	199 05.5	27.9
	2	214 05.5	28.7
	3	229 05.5	·· 29.4
	4	244 05.5	30.2
	5	259 05.5	31.0
	6	274 05.5	−15 31.7
	7	289 05.5	32.5
	8	304 05.4	33.3
	9	319 05.4	·· 34.0
	10	334 05.4	34.8
	11	349 05.4	35.5
	12	4 05.4	−15 36.3
	13	19 05.4	37.1
	14	34 05.4	37.8
	15	49 05.3	·· 38.6
	16	64 05.3	39.4
	17	79 05.3	40.1
	18	94 05.3	−15 40.9
	19	109 05.3	41.6
	20	124 05.3	42.4
	21	139 05.2	·· 43.2
	22	154 05.2	43.9
	23	169 05.2	44.7
	24	184 05.2	−15 45.4
	code	—	− 7

No.	STARS Name	SHA ° ′	Dec. ° ′
7	Acamar	315 51.2	−40 28.9
5	Achernar	335 58.7	−57 27.9
30	Acrux	173 59.2	−62 50.8
19	Adhara	255 46.9	−28 54.3
10	Aldebaran	291 39.5	+16 25.3
32	Alioth	166 59.6	+56 12.1
34	Alkaid	153 33.8	+49 32.2
55	Al Na'ir	28 38.6	−47 10.9
15	Alnilam	276 30.7	− 1 13.6
25	Alphard	218 39.3	− 8 27.6
41	Alphecca	126 48.5	+26 52.0
1	Alpheratz	358 28.8	+28 50.8
51	Altair	62 51.2	+ 8 45.0
2	Ankaa	353 58.5	−42 33.0
42	Antares	113 20.5	−26 20.0
37	Arcturus	146 36.1	+19 25.0
43	Atria	109 02.4	−68 57.0
22	Avior	234 36.0	−59 21.5
13	Bellatrix	279 18.9	+ 6 18.7
16	Betelg'se	271 48.6	+ 7 24.1
17	Canopus	264 15.3	−52 39.9
12	Capella	281 39.0	+45 57.2
53	Deneb	50 01.5	+45 07.4
28	Denebola	183 18.6	+14 49.4
4	Diphda	349 39.6	−18 13.9
27	Dubhe	194 45.7	+61 59.4
14	Elnath	279 07.9	+28 34.3
47	Eltanin	91 06.9	+51 29.8
54	Enif	34 30.2	+ 9 40.3
56	Fomalhaut	16 12.1	−29 51.7
31	Gacrux	172 50.6	−56 51.5
29	Gienah	176 37.8	−17 17.4
35	Hadar	149 51.1	−60 09.4
6	Hamal	328 50.1	+23 15.2
48	Kaus Aust.	84 42.3	−34 24.6
40	Kochab	137 19.0	+74 20.3
57	Markab	14 22.0	+14 58.0
8	Menkar	315 00.7	+ 3 55.0
36	Menkent	148 59.9	−36 08.9
24	Miapl'dus	221 49.4	−69 31.6
9	Mirfak	309 42.9	+49 42.3
50	Nunki	76 52.9	−26 21.3
52	Peacock	54 28.4	−56 53.1
21	Pollux	244 21.3	+28 08.1
20	Procyon	245 45.6	+ 5 20.6
46	R'alhague	96 47.5	+12 35.6
26	Regulus	208 30.3	+12 11.3
11	Rigel	281 54.0	− 8 15.0
38	Rigil Kent.	140 52.6	−60 39.1
44	Sabik	103 03.2	−15 40.2
3	Schedar	350 30.3	+56 17.7
45	Shaula	97 21.9	−37 04.4
18	Sirius	259 12.3	−16 39.0
33	Spica	159 17.9	−10 55.6
23	Suhail	223 24.9	−43 14.7
49	Vega	81 09.0	+38 44.7
39	Zub'g'bi	137 54.5	−15 51.3

Lat. °	Sunrise h m	Twlt. begins h m	Moonrise 3 h m	Moonrise 4 h m	Moonrise 5 h m	Moonrise 6 h m
N 72	9 13	4 55	15 52	15 07	14 38	14 13
70	8 43	4 57	15 15	14 49	14 30	14 13
68	8 22	4 59	14 48	14 34	14 23	14 12
66	8 04	5 01	14 28	14 22	14 17	14 11
64	7 50	5 02	14 12	14 12	14 12	14 11
62	7 39	5 03	13 58	14 03	14 07	14 11
60	7 29	5 03	13 47	13 56	14 04	14 10
58	7 20	5 03	13 37	13 49	14 00	14 10
56	7 12	5 03	13 28	13 44	13 57	14 10
54	7 06	5 03	13 20	13 38	13 54	14 10
52	6 59	5 03	13 13	13 33	13 52	14 09
50	6 54	5 02	13 06	13 29	13 50	14 09
45	6 42	5 00	12 53	13 20	13 44	14 09
40	6 32	4 59	12 41	13 12	13 40	14 08
35	6 23	4 56	12 31	13 05	13 37	14 08
30	6 16	4 54	12 23	12 59	13 33	14 08
20	6 03	4 47	12 08	12 48	13 28	14 07
10	5 51	4 39	11 55	12 39	13 23	14 07
0	5 40	4 29	11 43	12 31	13 18	14 07
10	5 29	4 16	11 30	12 22	13 14	14 06
20	5 17	4 00	11 17	12 13	13 09	14 06
30	5 03	3 37	11 02	12 02	13 03	14 06
35	4 55	3 22	10 53	11 56	13 00	14 06
40	4 46	3 03	10 43	11 49	12 56	14 05
45	4 35	2 39	10 31	11 40	12 52	14 05
50	4 22	2 04	10 17	11 31	12 46	14 05
52	4 16	1 45	10 10	11 26	12 44	14 05
54	4 09	1 18	10 03	11 21	12 41	14 05
56	4 01	0 37	9 54	11 15	12 39	14 05
58	3 53	////	9 44	11 09	12 35	14 04
60	3 43	////	9 34	11 02	12 32	14 04
S						

Lat. °	Sunset h m	Twlt. ends h m	Moonset 3 h m	Moonset 4 h m	Moonset 5 h m	Moonset 6 h m
N 72	14 13	18 27	20 17	22 42	24 53	0 53
70	14 43	18 26	20 52	22 58	24 59	0 59
68	15 04	18 23	21 17	23 11	25 03	1 03
66	15 22	18 23	21 36	23 22	25 07	1 07
64	15 36	18 22	21 52	23 30	25 10	1 10
62	15 48	18 22	22 04	23 38	25 13	1 13
60	15 58	18 22	22 15	23 44	25 15	1 15
58	16 06	18 21	22 24	23 49	25 17	1 17
56	16 14	18 21	22 32	23 54	25 19	1 19
54	16 21	18 22	22 39	23 59	25 21	1 21
52	16 27	18 22	22 46	24 03	0 03	1 22
50	16 33	18 23	22 52	24 06	0 06	1 23
45	16 45	18 25	23 04	24 14	0 14	1 26
40	16 55	18 27	23 14	24 21	0 21	1 29
35	17 03	18 29	23 23	24 26	0 26	1 31
30	17 11	18 32	23 31	24 31	0 31	1 33
20	17 24	18 39	23 44	24 39	0 39	1 36
10	17 36	18 48	23 55	24 46	0 46	1 39
0	17 47	18 58	24 06	0 06	0 53	1 41
10	17 58	19 11	24 16	0 16	1 00	1 44
20	18 10	19 28	24 27	0 27	1 07	1 46
30	18 24	19 51	0 03	0 40	1 15	1 49
35	18 32	20 06	0 12	0 47	1 19	1 51
40	18 42	20 26	0 23	0 55	1 25	1 53
45	18 53	20 51	0 36	1 05	1 31	1 55
50	19 06	21 27	0 52	1 16	1 38	1 57
52	19 12	21 47	0 59	1 22	1 41	1 59
54	19 19	22 15	1 07	1 28	1 44	2 00
56	19 27	23 02	1 16	1 34	1 48	2 01
58	19 36	////	1 27	1 41	1 53	2 03
60	19 46	////	1 38	1 49	1 58	2 05
S						

Equation of Time (App.—Mean)

GMT h	3 m s	4 m s	5 m s
0	+16 22.6	+16 22.8	+16 22.2
6	+16 22.7	+16 22.7	+16 21.9
12	+16 22.8	+16 22.6	+16 21.6
18	+16 22.8	+16 22.4	+16 21.2
24	+16 22.8	+16 22.2	+16 20.7

GMT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
3	17 54	12 50	17 57	5 20	11 52
4	18 42	12 45	17 56	5 16	11 48
5	19 30	12 40	17 55	5 12	11 45
6	20 18	12 34	17 54	5 08	11 41

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0	0.5	0.5	0.1
30	0.5	0.4	0.1
45	0.5	0.3	0.1
60	0.5	0.2	0.1
75	0.5	0.1	0.0
90			

Moon's Lower Limb Add

Alt. °	3 ′	4 ′	5 ′
0	14.8	15.8	17.1
4	14.8	15.8	17.1
8	14.8	15.8	17.1
12	14.8	15.8	17.0
16	14.8	15.8	17.0
20	14.8	15.8	17.0
24	14.8	15.8	17.0
28	14.9	15.8	16.9
32	14.9	15.8	16.9
36	14.9	15.8	16.8
40	14.9	15.8	16.8
44	15.0	15.7	16.7
48	15.0	15.7	16.6
52	15.0	15.7	16.6
56	15.1	15.7	16.5
60	15.1	15.7	16.4
64	15.1	15.7	16.4
68	15.2	15.7	16.3
72	15.2	15.7	16.2
76	15.3	15.6	16.1
80	15.3	15.6	16.0
84	15.3	15.6	16.0
88	15.4	15.6	15.9
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt. °	3 ′	4 ′	5 ′
0	16.0	15.4	14.7
4	16.0	15.4	14.7
8	16.0	15.4	14.7
12	16.0	15.4	14.7
16	16.0	15.4	14.7
20	15.9	15.4	14.8
24	15.9	15.4	14.8
28	15.9	15.4	14.8
32	15.9	15.4	14.9
36	15.9	15.4	14.9
40	15.8	15.5	15.0
44	15.8	15.5	15.0
48	15.8	15.5	15.1
52	15.7	15.5	15.2
56	15.7	15.5	15.2
60	15.7	15.5	15.3
64	15.6	15.5	15.4
68	15.6	15.5	15.5
72	15.6	15.6	15.5
76	15.5	15.6	15.6
80	15.5	15.6	15.7
84	15.4	15.6	15.8
88	15.4	15.6	15.9
90			

Subtract from table, back cover

First Quarter 3

G M T	♈ GHA	VENUS −3.6 GHA	Dec.	MARS 0.2 GHA	Dec.	JUPITER −1.9 GHA	Dec.	SATURN 0.7 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
6 0	44 40.5	170 47.9	−24 56.2	91 22.6	−19 37.0	282 42.9	+20 25.5	184 14.9	−13 27.7	65 24.8	118	− 3 50.9	+143
1	59 43.0	185 51.5	55.6	106 23.3	36.5	297 45.2	25.5	199 17.1	27.8	79 55.6	118	3 36.6	+143
2	74 45.4	200 55.0	55.0	121 24.1	36.0	312 47.6	25.5	214 19.2	27.9	94 26.4	117	3 22.3	+144
3	89 47.9	215 58.6	·· 54.4	136 24.8	·· 35.4	327 50.0	·· 25.5	229 21.4	·· 28.0	108 57.1	117	· 3 07.9	+144
4	104 50.4	231 02.1	53.8	151 25.6	34.9	342 52.3	25.4	244 23.6	28.1	123 27.8	117	2 53.5	+144
5	119 52.8	246 05.7	53.2	166 26.3	34.4	357 54.7	25.4	259 25.7	28.2	137 58.5	116	2 39.1	+145
6	134 55.3	261 09.3	−24 52.6	181 27.1	−19 33.8	12 57.1	+20 25.4	274 27.9	−13 28.3	152 29.1	116	− 2 24.6	+144
7	149 57.8	276 12.8	52.0	196 27.9	33.3	27 59.4	25.4	289 30.1	28.4	166 59.7	116	2 10.2	+146
8	165 00.2	291 16.4	51.4	211 28.6	32.8	43 01.8	25.4	304 32.2	28.5	181 30.3	115	1 55.6	+145
9	180 02.7	306 20.0	·· 50.8	226 29.4	·· 32.2	58 04.2	·· 25.4	319 34.4	·· 28.6	196 00.8	115	· 1 41.1	+146
10	195 05.2	321 23.5	50.2	241 30.1	31.7	73 06.6	25.4	334 36.6	28.7	210 31.3	115	1 26.5	+146
11	210 07.6	336 27.1	49.6	256 30.9	31.1	88 08.9	25.4	349 38.8	28.7	225 01.8	114	1 11.9	+147
12	225 10.1	351 30.7	−24 48.9	271 31.6	−19 30.6	103 11.3	+20 25.4	4 40.9	−13 28.8	239 32.2	114	− 0 57.2	+146
13	240 12.6	6 34.3	48.3	286 32.4	30.1	118 13.7	25.3	19 43.1	28.9	254 02.6	113	0 42.6	+147
14	255 15.0	21 37.9	47.7	301 33.1	29.5	133 16.0	25.3	34 45.3	29.0	268 32.9	113	0 27.9	+147
15	270 17.5	36 41.5	·· 47.1	316 33.9	·· 29.0	148 18.4	·· 25.3	49 47.4	·· 29.1	283 03.2	113	− 0 13.2	+147
16	285 19.9	51 45.1	46.5	331 34.6	28.5	163 20.8	25.3	64 49.6	29.2	297 33.5	112	+ 0 01.5	+148
17	300 22.4	66 48.7	45.8	346 35.4	27.9	178 23.2	25.3	79 51.8	29.3	312 03.7	111	0 16.3	+148
18	315 24.9	81 52.3	−24 45.2	1 36.2	−19 27.4	193 25.5	+20 25.3	94 53.9	−13 29.4	326 33.8	111	+ 0 31.1	+148
19	330 27.3	96 55.9	44.6	16 36.9	26.8	208 27.9	25.3	109 56.1	29.5	341 03.9	111	0 45.9	+148
20	345 29.8	111 59.5	44.0	31 37.7	26.3	223 30.3	25.3	124 58.3	29.6	355 34.0	110	1 00.7	+148
21	0 32.3	127 03.1	·· 43.3	46 38.4	·· 25.8	238 32.7	·· 25.3	140 00.5	·· 29.7	10 04.0	110	· 1 15.5	+148
22	15 34.7	142 06.7	42.7	61 39.2	25.2	253 35.0	25.2	155 02.6	29.8	24 34.0	109	1 30.3	+148
23	30 37.2	157 10.3	42.1	76 39.9	24.7	268 37.4	25.2	170 04.8	29.8	39 03.9	108	1 45.1	+149
7 0	45 39.7	172 13.9	−24 41.4	91 40.7	−19 24.2	283 39.8	+20 25.2	185 07.0	−13 29.9	53 33.7	108	+ 2 00.0	+149
1	60 42.1	187 17.6	40.8	106 41.4	23.6	298 42.2	25.2	200 09.1	30.0	68 03.5	108	2 14.9	+148
2	75 44.6	202 21.2	40.1	121 42.2	23.1	313 44.5	25.2	215 11.3	30.1	82 33.3	107	2 29.7	+149
3	90 47.0	217 24.8	·· 39.5	136 42.9	·· 22.5	328 46.9	·· 25.2	230 13.5	·· 30.2	97 03.0	106	· 2 44.6	+149
4	105 49.5	232 28.4	38.8	151 43.7	22.0	343 49.3	25.2	245 15.6	30.3	111 32.6	106	2 59.5	+149
5	120 52.0	247 32.1	38.2	166 44.4	21.5	358 51.7	25.2	260 17.8	30.4	126 02.2	105	3 14.4	+149
6	135 54.4	262 35.7	−24 37.5	181 45.2	−19 20.9	13 54.1	+20 25.2	275 20.0	−13 30.5	140 31.7	105	+ 3 29.3	+148
7	150 56.9	277 39.3	36.9	196 46.0	20.4	28 56.4	25.1	290 22.2	30.6	155 01.2	104	3 44.1	+149
8	165 59.4	292 43.0	36.2	211 46.7	19.8	43 58.8	25.1	305 24.3	30.7	169 30.6	103	3 59.0	+149
9	181 01.8	307 46.6	·· 35.6	226 47.5	·· 19.3	59 01.2	·· 25.1	320 26.5	·· 30.8	183 59.9	103	· 4 13.9	+149
10	196 04.3	322 50.3	34.9	241 48.2	18.7	74 03.6	25.1	335 28.7	30.8	198 29.2	102	4 28.8	+148
11	211 06.8	337 53.9	34.2	256 49.0	18.2	89 06.0	25.1	350 30.8	30.9	212 58.4	101	4 43.6	+149
12	226 09.2	352 57.6	−24 33.6	271 49.7	−19 17.7	104 08.3	+20 25.1	5 33.0	−13 31.0	227 27.5	101	+ 4 58.5	+149
13	241 11.7	8 01.2	32.9	286 50.5	17.1	119 10.7	25.1	20 35.2	31.1	241 56.6	100	5 13.4	+148
14	256 14.2	23 04.9	32.2	301 51.2	16.6	134 13.1	25.1	35 37.3	31.2	256 25.6	100	5 28.2	+148
15	271 16.6	38 08.5	·· 31.6	316 52.0	·· 16.0	149 15.5	·· 25.1	50 39.5	·· 31.3	270 54.6	98	· 5 43.0	+148
16	286 19.1	53 12.2	30.9	331 52.7	15.5	164 17.9	25.1	65 41.7	31.4	285 23.4	98	5 57.8	+148
17	301 21.5	68 15.9	30.2	346 53.5	14.9	179 20.2	25.0	80 43.9	31.5	299 52.2	97	6 12.6	+148
18	316 24.0	83 19.5	−24 29.6	1 54.3	−19 14.4	194 22.6	+20 25.0	95 46.0	−13 31.6	314 20.9	97	+ 6 27.4	+148
19	331 26.5	98 23.2	28.9	16 55.0	13.9	209 25.0	25.0	110 48.2	31.7	328 49.6	96	6 42.2	+147
20	346 28.9	113 26.9	28.2	31 55.8	13.3	224 27.4	25.0	125 50.4	31.8	343 18.2	95	6 56.9	+147
21	1 31.4	128 30.6	·· 27.5	46 56.5	·· 12.8	239 29.8	·· 25.0	140 52.5	·· 31.9	357 46.7	94	· 7 11.6	+147
22	16 33.9	143 34.2	26.8	61 57.3	12.2	254 32.2	25.0	155 54.7	31.9	12 15.1	94	7 26.3	+147
23	31 36.3	158 37.9	26.1	76 58.0	11.7	269 34.5	25.0	170 56.9	32.0	26 43.5	92	7 41.0	+146
8 0	46 38.8	173 41.6	−24 25.5	91 58.8	−19 11.1	284 36.9	+20 25.0	185 59.0	−13 32.1	41 11.7	92	+ 7 55.6	+146
1	61 41.3	188 45.3	24.8	106 59.5	10.6	299 39.3	25.0	201 01.2	32.2	55 39.9	91	8 10.2	+146
2	76 43.7	203 49.0	24.1	122 00.3	10.0	314 41.7	25.0	216 03.4	32.3	70 08.0	91	8 24.8	+145
3	91 46.2	218 52.7	·· 23.4	137 01.0	·· 09.5	329 44.1	·· 25.0	231 05.6	·· 32.4	84 36.1	89	· 8 39.3	+145
4	106 48.7	233 56.4	22.7	152 01.8	08.9	344 46.5	24.9	246 07.7	32.5	99 04.0	89	8 53.8	+144
5	121 51.1	249 00.1	22.0	167 02.6	08.4	359 48.9	24.9	261 09.9	32.6	113 31.9	88	9 08.2	+145
6	136 53.6	264 03.8	−24 21.3	182 03.3	−19 07.9	14 51.2	+20 24.9	276 12.1	−13 32.7	127 59.7	87	+ 9 22.7	+143
7	151 56.0	279 07.5	20.6	197 04.1	07.3	29 53.6	24.9	291 14.2	32.8	142 27.4	86	9 37.0	+144
8	166 58.5	294 11.2	19.9	212 04.8	06.8	44 56.0	24.9	306 16.4	32.9	156 55.0	85	9 51.4	+143
9	182 01.0	309 14.9	·· 19.2	227 05.6	·· 06.2	59 58.4	·· 24.9	321 18.6	·· 32.9	171 22.5	85	·10 05.7	+142
10	197 03.4	324 18.6	18.5	242 06.3	05.7	75 00.8	24.9	336 20.7	33.0	185 50.0	83	10 19.9	+142
11	212 05.9	339 22.3	17.8	257 07.1	05.1	90 03.2	24.9	351 22.9	33.1	200 17.3	83	10 34.1	+141
12	227 08.4	354 26.0	−24 17.0	272 07.8	−19 04.6	105 05.6	+20 24.9	6 25.1	−13 33.2	214 44.6	82	+10 48.2	+141
13	242 10.8	9 29.7	16.3	287 08.6	04.0	120 08.0	24.9	21 27.3	33.3	229 11.8	81	11 02.3	+141
14	257 13.3	24 33.5	15.6	302 09.3	03.5	135 10.4	24.9	36 29.4	33.4	243 38.9	80	11 16.4	+139
15	272 15.8	39 37.2	·· 14.9	317 10.1	·· 02.9	150 12.7	·· 24.8	51 31.6	·· 33.5	258 05.9	79	·11 30.3	+140
16	287 18.2	54 40.9	14.2	332 10.9	02.4	165 15.1	24.8	66 33.8	33.6	272 32.8	78	11 44.3	+138
17	302 20.7	69 44.6	13.5	347 11.6	01.8	180 17.5	24.8	81 35.9	33.7	286 59.6	77	11 58.1	+138
18	317 23.2	84 48.4	−24 12.7	2 12.4	−19 01.3	195 19.9	+20 24.8	96 38.1	−13 33.8	301 26.3	77	+12 11.9	+137
19	332 25.6	99 52.1	12.0	17 13.1	00.7	210 22.3	24.8	111 40.3	33.9	315 53.0	75	12 25.6	+137
20	347 28.1	114 55.8	11.3	32 13.9	19 00.2	225 24.7	24.8	126 42.5	33.9	330 19.5	74	12 39.3	+136
21	2 30.5	129 59.6	·· 10.5	47 14.6	·18 59.6	240 27.1	·· 24.8	141 44.6	·· 34.0	344 45.9	74	·12 52.9	+135
22	17 33.0	145 03.3	09.8	62 15.4	59.1	255 29.5	24.8	156 46.8	34.1	359 12.3	73	13 06.4	+134
23	32 35.5	160 07.0	09.1	77 16.1	58.5	270 31.9	24.8	171 49.0	34.2	13 38.6	71	13 19.8	+134
24	47 37.9	175 10.8	−24 08.3	92 16.9	−18 58.0	285 34.3	+20 24.8	186 51.1	−13 34.3	28 04.7	71	+13 33.2	+133
code	--	+ 36	+ 7	+ 8	+ 6	+ 24	0	+ 22	− 1				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
6 0	184 05.2	−15 45.4
1	199 05.2	46.2
2	214 05.1	46.9
3	229 05.1	•• 47.7
4	244 05.1	48.5
5	259 05.1	49.2
6	274 05.1	−15 50.0
7	289 05.0	50.7
8	304 05.0	51.5
9	319 05.0	•• 52.2
10	334 05.0	53.0
11	349 04.9	53.7
12	4 04.9	−15 54.5
13	19 04.9	55.2
14	34 04.9	56.0
15	49 04.8	•• 56.7
16	64 04.8	57.5
17	79 04.8	58.2
18	94 04.8	−15 59.0
19	109 04.7	15 59.7
20	124 04.7	16 00.5
21	139 04.7	•• 01.2
22	154 04.7	02.0
23	169 04.6	02.7
7 0	184 04.6	−16 03.5
1	199 04.6	04.2
2	214 04.6	05.0
3	229 04.5	•• 05.7
4	244 04.5	06.5
5	259 04.5	07.2
6	274 04.4	−16 07.9
7	289 04.4	08.7
8	304 04.4	09.4
9	319 04.3	•• 10.2
10	334 04.3	10.9
11	349 04.3	11.7
12	4 04.3	−16 12.4
13	19 04.2	13.1
14	34 04.2	13.9
15	49 04.2	•• 14.6
16	64 04.1	15.4
17	79 04.1	16.1
18	94 04.1	−16 16.8
19	109 04.0	17.6
20	124 04.0	18.3
21	139 04.0	•• 19.0
22	154 03.9	19.8
23	169 03.9	20.5
8 0	184 03.8	−16 21.3
1	199 03.8	22.0
2	214 03.8	22.7
3	229 03.7	•• 23.5
4	244 03.7	24.2
5	259 03.7	24.9
6	274 03.6	−16 25.7
7	289 03.6	26.4
8	304 03.5	27.1
9	319 03.5	•• 27.9
10	334 03.5	28.6
11	349 03.4	29.3
12	4 03.4	−16 30.0
13	19 03.3	30.8
14	34 03.3	31.5
15	49 03.3	•• 32.2
16	64 03.2	33.0
17	79 03.2	33.7
18	94 03.1	−16 34.4
19	109 03.1	35.1
20	124 03.0	35.9
21	139 03.0	•• 36.6
22	154 03.0	37.3
23	169 02.9	38.0
24	184 02.9	−16 38.8
code	—	— 7

STARS No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.2	−40 28.9
5	Achernar	335 58.7	−57 27.9
30	Acrux	173 59.2	−62 50.8
19	Adhara	255 46.9	−28 54.3
10	Aldebaran	291 39.5	+16 25.3
32	Alioth	166 59.5	+56 12.1
34	Alkaid	153 33.8	+49 32.2
55	Al Na'ir	28 38.6	−47 10.9
15	Alnilam	276 30.7	− 1 13.6
25	Alphard	218 39.3	− 8 27.6
41	Alphecca	126 48.5	+26 52.0
1	Alpheratz	358 28.8	+28 50.8
51	Altair	62 51.2	+ 8 45.0
2	Ankaa	353 58.6	−42 33.0
42	Antares	113 20.5	−26 20.0
37	Arcturus	146 36.1	+19 25.0
43	Atria	109 02.4	−68 57.0
22	Avior	234 36.0	−59 21.5
13	Bellatrix	279 18.9	+ 6 18.7
16	Betelg'se	271 48.6	+ 7 24.1
17	Canopus	264 15.3	−52 39.9
12	Capella	281 39.0	+45 57.3
53	Deneb	50 01.5	+45 07.4
28	Denebola	183 18.6	+14 49.4
4	Diphda	349 39.6	−18 13.9
27	Dubhe	194 45.6	+61 59.4
14	Elnath	279 07.9	+28 34.3
47	Eltanin	91 07.0	+51 29.8
54	Enif	34 30.2	+ 9 40.3
56	Fomalhaut	16 12.2	−29 51.7
31	Gacrux	172 50.5	−56 51.5
29	Gienah	176 37.8	−17 17.4
35	Hadar	149 51.1	−60 09.3
6	Hamal	328 50.1	+23 15.2
48	Kaus Aust.	84 42.3	−34 24.6
40	Kochab	137 19.0	+74 20.3
57	Markab	14 22.0	+14 58.0
8	Menkar	315 00.7	+ 3 55.0
36	Menkent	148 59.9	−36 08.9
24	Miapl'dus	221 49.3	−69 31.6
9	Mirfak	309 42.9	+49 42.3
50	Nunki	76 52.9	−26 21.3
52	Peacock	54 28.4	−56 53.1
21	Pollux	244 21.2	+28 08.1
20	Procyon	245 45.6	+ 5 20.6
46	R'alhague	96 47.5	+12 35.6
26	Regulus	208 30.3	+12 11.3
11	Rigel	281 54.0	− 8 15.0
38	Rigil Kent.	140 52.6	−60 39.1
44	Sabik	103 03.2	−15 40.2
3	Schedar	350 30.3	+56 17.7
45	Shaula	97 21.9	−37 04.4
18	Sirius	259 12.2	−16 39.0
33	Spica	159 17.9	−10 55.6
23	Suhail	223 24.9	−43 14.7
49	Vega	81 09.0	+38 44.7
39	Zub'g'bi	137 54.5	−15 51.3

Lat.	Sunrise	Twilt. begins	Moonrise 6	7	8	9
N °	h m	h m	h m	h m	h m	h m
72	9 34	5 06	14 13	13 48	13 18	12 28
70	8 59	5 08	14 13	13 55	13 35	13 07
68	8 35	5 08	14 12	14 01	13 49	13 34
66	8 15	5 09	14 11	14 06	14 01	13 55
64	8 00	5 09	14 11	14 11	14 11	14 12
62	7 47	5 09	14 11	14 14	14 19	14 26
60	7 36	5 09	14 10	14 18	14 26	14 38
58	7 27	5 09	14 10	14 21	14 33	14 49
56	7 19	5 09	14 10	14 23	14 38	14 58
54	7 11	5 07	14 10	14 25	14 44	15 06
52	7 05	5 07	14 09	14 28	14 48	15 14
50	6 59	5 07	14 09	14 30	14 52	15 20
45	6 46	5 05	14 09	14 34	15 02	15 34
40	6 35	5 02	14 08	14 37	15 09	15 46
35	6 26	4 59	14 08	14 41	15 16	15 56
30	6 18	4 55	14 08	14 44	15 22	16 05
20	6 04	4 49	14 07	14 48	15 32	16 21
10	5 52	4 40	14 07	14 53	15 41	16 34
0	5 40	4 28	14 07	14 57	15 50	16 47
10	5 28	4 16	14 06	15 01	15 59	17 00
20	5 16	3 58	14 06	15 06	16 08	17 14
30	5 01	3 34	14 06	15 11	16 19	17 30
35	4 53	3 18	14 06	15 14	16 25	17 40
40	4 43	2 59	14 05	15 17	16 33	17 51
45	4 31	2 33	14 05	15 21	16 41	18 03
50	4 17	1 55	14 05	15 26	16 51	18 19
52	4 11	1 33	14 05	15 29	16 56	18 26
54	4 04	1 02	14 05	15 31	17 01	18 35
56	3 55	////	14 05	15 34	17 07	18 44
58	3 46	////	14 04	15 37	17 14	18 54
60	3 36	////	14 04	15 40	17 21	19 06
S						

Lat.	Sunset	Twilt. ends	Moonset 6	7	8	9
N °	h m	h m	h m	h m	h m	h m
72	13 52	18 16	0 53	3 04	5 24	8 12
70	14 27	18 15	0 59	3 00	5 09	7 35
68	14 52	18 15	1 03	2 57	4 58	7 09
66	15 11	18 15	1 07	2 55	4 48	6 49
64	15 26	18 14	1 10	2 52	4 40	6 34
62	15 39	18 15	1 13	2 51	4 33	6 21
60	15 50	18 15	1 15	2 49	4 27	6 10
58	16 00	18 16	1 17	2 47	4 22	6 00
56	16 08	18 16	1 19	2 46	4 17	5 52
54	16 15	18 17	1 21	2 45	4 13	5 45
52	16 22	18 18	1 22	2 44	4 09	5 38
50	16 28	18 19	1 23	2 43	4 06	5 32
45	16 41	18 21	1 26	2 41	3 59	5 20
40	16 52	18 24	1 29	2 39	3 53	5 09
35	17 01	18 27	1 31	2 38	3 47	5 00
30	17 09	18 31	1 33	2 36	3 43	4 53
20	17 23	18 38	1 36	2 34	3 35	4 39
10	17 35	18 47	1 39	2 32	3 28	4 28
0	17 47	18 59	1 41	2 30	3 22	4 17
10	17 59	19 13	1 44	2 28	3 15	4 06
20	18 12	19 31	1 46	2 26	3 08	3 54
30	18 27	19 55	1 49	2 24	3 01	3 41
35	18 35	20 10	1 51	2 22	2 56	3 34
40	18 45	20 31	1 53	2 21	2 51	3 25
45	18 57	20 58	1 55	2 19	2 45	3 15
50	19 11	21 37	1 57	2 17	2 38	3 03
52	19 18	21 59	1 59	2 16	2 35	2 57
54	19 25	22 32	2 00	2 15	2 32	2 51
56	19 33	////	2 01	2 14	2 28	2 45
58	19 43	////	2 03	2 13	2 24	2 37
60	19 54	////	2 05	2 11	2 19	2 29
S						

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.5	0.5	0.1
30			
	0.5	0.4	0.1
45			
	0.5	0.3	0.1
60			
	0.5	0.2	0.1
75			
	0.5	0.1	0.0
90			

Moon's Lower Limb **Add**

Alt.	6	7	8
°	′	′	′
0			
	18.2	19.4	20.4
4			
	18.2	19.4	20.4
8			
	18.2	19.3	20.3
12			
	18.2	19.3	20.3
16			
	18.1	19.2	20.2
20			
	18.1	19.2	20.1
24			
	18.0	19.1	20.0
28			
	17.9	19.0	19.9
32			
	17.9	18.9	19.7
36			
	17.8	18.7	19.6
40			
	17.7	18.6	19.4
44			
	17.6	18.5	19.2
48			
	17.5	18.3	19.0
52			
	17.4	18.1	18.8
56			
	17.2	18.0	18.6
60			
	17.1	17.8	18.4
64			
	17.0	17.6	18.1
68			
	16.8	17.4	17.9
72			
	16.7	17.2	17.6
76			
	16.6	17.0	17.4
80			
	16.4	16.8	17.1
84			
	16.3	16.6	16.9
88			
	16.2	16.4	16.7
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	6	7	8
°	′	′	′
0			
	14.0	13.4	12.8
4			
	14.0	13.4	12.8
8			
	14.1	13.4	12.8
12			
	14.1	13.5	12.9
16			
	14.1	13.5	13.0
20			
	14.2	13.6	13.1
24			
	14.2	13.7	13.2
28			
	14.3	13.8	13.3
32			
	14.4	13.9	13.4
36			
	14.5	14.0	13.6
40			
	14.6	14.1	13.8
44			
	14.7	14.3	13.9
48			
	14.8	14.4	14.1
52			
	14.9	14.6	14.3
56			
	15.0	14.8	14.6
60			
	15.1	15.0	14.8
64			
	15.3	15.1	15.0
68			
	15.4	15.3	15.3
72			
	15.5	15.5	15.5
76			
	15.7	15.7	15.8
80			
	15.8	15.9	16.1
84			
	16.0	16.2	16.3
88			
	16.1	16.3	16.5
90			

Subtract from table, back cover

Equation of Time (App.—Mean)

GMT	6	7	8
h	m s	m s	m s
0	+16 20.7	+16 18.5	+16 15.5
6	+16 20.3	+16 17.8	+16 14.6
12	+16 19.7	+16 17.1	+16 13.6
18	+16 19.1	+16 16.3	+16 12.6
24	+16 18.5	+16 15.5	+16 11.6

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
6	20 18	12 34	17 54	5 08	11 41
7	21 09	12 28	17 52	5 05	11 38
8	22 03	12 22	17 51	5 01	11 34
9	23 01	12 16	17 50	4 57	11 31

G M T		♈	VENUS −3.4		MARS 0.2		JUPITER −1.9		SATURN 0.7		MOON			
		GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
9	0	47 37.9	175 10.8	−24 08.3	92 16.9	−18 58.0	285 34.3	+20 24.8	186 51.1	−13 34.3	28 04.7	71	+13 33.2	+133
	1	62 40.4	190 14.5	07.6	107 17.6	57.4	300 36.7	24.8	201 53.3	34.4	42 30.8	70	13 46.5	+132
	2	77 42.9	205 18.3	06.9	122 18.4	56.8	315 39.1	24.8	216 55.5	34.5	56 56.8	68	13 59.7	+131
	3	92 45.3	220 22.0	•• 06.1	137 19.2	•• 56.3	330 41.5	•• 24.8	231 57.6	•• 34.6	71 22.6	68	·14 12.8	+131
	4	107 47.8	235 25.8	05.4	152 19.9	55.7	345 43.8	24.8	246 59.8	34.7	85 48.4	67	14 25.9	+129
	5	122 50.3	250 29.5	04.6	167 20.7	55.2	0 46.2	24.7	262 02.0	34.8	100 14.1	66	14 38.8	+129
	6	137 52.7	265 33.3	−24 03.9	182 21.4	−18 54.6	15 48.6	+20 24.7	277 04.2	−13 34.9	114 39.7	65	+14 51.7	+128
	7	152 55.2	280 37.0	03.1	197 22.2	54.1	30 51.0	24.7	292 06.3	34.9	129 05.2	64	15 04.5	+126
	8	167 57.6	295 40.8	02.4	212 22.9	53.5	45 53.4	24.7	307 08.5	35.0	143 30.6	63	15 17.1	+126
	9	183 00.1	310 44.6	•• 01.6	227 23.7	•• 53.0	60 55.8	•• 24.7	322 10.7	•• 35.1	157 55.9	62	·15 29.7	+125
	10	198 02.6	325 48.3	00.9	242 24.4	52.4	75 58.2	24.7	337 12.8	35.2	172 21.1	61	15 42.2	+124
	11	213 05.0	340 52.1	24 00.1	257 25.2	51.9	91 00.6	24.7	352 15.0	35.3	186 46.2	60	15 54.6	+123
	12	228 07.5	355 55.9	−23 59.4	272 25.9	−18 51.3	106 03.0	+20 24.7	7 17.2	−13 35.4	201 11.2	59	+16 06.9	+122
	13	243 10.0	10 59.6	58.6	287 26.7	50.7	121 05.4	24.7	22 19.3	35.5	215 36.1	58	16 19.1	+121
	14	258 12.4	26 03.4	57.8	302 27.5	50.2	136 07.8	24.7	37 21.5	35.6	230 00.9	57	16 31.2	+120
	15	273 14.9	41 07.2	•• 57.1	317 28.2	•• 49.6	151 10.2	•• 24.7	52 23.7	•• 35.7	244 25.6	56	·16 43.2	+118
	16	288 17.4	56 10.9	56.3	332 29.0	49.1	166 12.6	24.7	67 25.9	35.8	258 50.2	56	16 55.0	+118
	17	303 19.8	71 14.7	55.5	347 29.7	48.5	181 15.0	24.7	82 28.0	35.8	273 14.8	54	17 06.8	+116
	18	318 22.3	86 18.5	−23 54.8	2 30.5	−18 48.0	196 17.4	+20 24.7	97 30.2	−13 35.9	287 39.2	53	+17 18.4	+116
	19	333 24.8	101 22.3	54.0	17 31.2	47.4	211 19.8	24.7	112 32.4	36.0	302 03.5	52	17 30.0	+114
	20	348 27.2	116 26.1	53.2	32 32.0	46.9	226 22.2	24.6	127 34.5	36.1	316 27.7	52	17 41.4	+113
	21	3 29.7	131 29.9	•• 52.5	47 32.7	•• 46.3	241 24.6	•• 24.6	142 36.7	•• 36.2	330 51.9	50	·17 52.7	+111
	22	18 32.1	146 33.7	51.7	62 33.5	45.7	256 27.0	24.6	157 38.9	36.3	345 15.9	50	18 03.8	+111
	23	33 34.6	161 37.4	50.9	77 34.3	45.2	271 29.4	24.6	172 41.0	36.4	359 39.9	48	18 14.9	+109
10	0	48 37.1	176 41.2	−23 50.1	92 35.0	−18 44.6	286 31.8	+20 24.6	187 43.2	−13 36.5	14 03.7	48	+18 25.8	+108
	1	63 39.5	191 45.0	49.3	107 35.8	44.1	301 34.2	24.6	202 45.4	36.6	28 27.5	47	18 36.6	+107
	2	78 42.0	206 48.8	48.5	122 36.5	43.5	316 36.6	24.6	217 47.6	36.7	42 51.2	46	18 47.3	+105
	3	93 44.5	221 52.6	•• 47.8	137 37.3	•• 42.9	331 39.0	•• 24.6	232 49.7	•• 36.8	57 14.8	45	·18 57.8	+104
	4	108 46.9	236 56.4	47.0	152 38.0	42.4	346 41.4	24.6	247 51.9	36.8	71 38.3	44	19 08.2	+103
	5	123 49.4	252 00.2	46.2	167 38.8	41.8	1 43.8	24.6	262 54.1	36.9	86 01.7	43	19 18.5	+101
	6	138 51.9	267 04.0	−23 45.4	182 39.5	−18 41.3	16 46.2	+20 24.6	277 56.2	−13 37.0	100 25.0	42	+19 28.6	+100
	7	153 54.3	282 07.8	44.6	197 40.3	40.7	31 48.6	24.6	292 58.4	37.1	114 48.2	42	19 38.6	+ 98
	8	168 56.8	297 11.6	43.8	212 41.1	40.1	46 51.0	24.6	308 00.6	37.2	129 11.4	40	19 48.4	+ 97
	9	183 59.3	312 15.4	•• 43.0	227 41.8	•• 39.6	61 53.4	•• 24.6	323 02.8	•• 37.3	143 34.4	40	·19 58.1	+ 96
	10	199 01.7	327 19.2	42.2	242 42.6	39.0	76 55.8	24.6	338 04.9	37.4	157 57.4	39	20 07.7	+ 94
	11	214 04.2	342 23.0	41.4	257 43.3	38.5	91 58.2	24.6	353 07.1	37.5	172 20.3	38	20 17.1	+ 93
	12	229 06.6	357 26.9	−23 40.6	272 44.1	−18 37.9	107 00.7	+20 24.6	8 09.3	−13 37.6	186 43.1	37	+20 26.4	+ 91
	13	244 09.1	12 30.7	39.8	287 44.8	37.3	122 03.1	24.6	23 11.4	37.7	201 05.8	37	20 35.5	+ 89
	14	259 11.6	27 34.5	39.0	302 45.6	36.8	137 05.5	24.5	38 13.6	37.7	215 28.5	35	20 44.4	+ 88
	15	274 14.0	42 38.3	•• 38.2	317 46.3	•• 36.2	152 07.9	•• 24.5	53 15.8	•• 37.8	229 51.0	35	·20 53.2	+ 87
	16	289 16.5	57 42.1	37.4	332 47.1	35.6	167 10.3	24.5	68 17.9	37.9	244 13.5	34	21 01.9	+ 85
	17	304 19.0	72 45.9	36.6	347 47.9	35.1	182 12.7	24.5	83 20.1	38.0	258 35.9	34	21 10.4	+ 83
	18	319 21.4	87 49.8	−23 35.8	2 48.6	−18 34.5	197 15.1	+20 24.5	98 22.3	−13 38.1	272 58.3	33	+21 18.7	+ 82
	19	334 23.9	102 53.6	34.9	17 49.4	34.0	212 17.5	24.5	113 24.5	38.2	287 20.6	32	21 26.9	+ 80
	20	349 26.4	117 57.4	34.1	32 50.1	33.4	227 19.9	24.5	128 26.6	38.3	301 42.8	31	21 34.9	+ 79
	21	4 28.8	133 01.2	•• 33.3	47 50.9	•• 32.8	242 22.3	•• 24.5	143 28.8	•• 38.4	316 04.9	31	·21 42.8	+ 77
	22	19 31.3	148 05.1	32.5	62 51.6	32.3	257 24.7	24.5	158 31.0	38.5	330 27.0	30	21 50.5	+ 75
	23	34 33.8	163 08.9	31.7	77 52.4	31.7	272 27.1	24.5	173 33.1	38.6	344 49.0	29	21 58.0	+ 73
11	0	49 36.2	178 12.7	−23 30.8	92 53.1	−18 31.1	287 29.6	+20 24.5	188 35.3	−13 38.6	359 10.9	29	+22 05.3	+ 72
	1	64 38.7	193 16.6	30.0	107 53.9	30.6	302 32.0	24.5	203 37.5	38.7	13 32.8	29	22 12.5	+ 70
	2	79 41.1	208 20.4	29.2	122 54.7	30.0	317 34.4	24.5	218 39.6	38.8	27 54.7	27	22 19.5	+ 69
	3	94 43.6	223 24.2	•• 28.4	137 55.4	•• 29.4	332 36.8	•• 24.5	233 41.8	•• 38.9	42 16.4	27	·22 26.4	+ 67
	4	109 46.1	238 28.1	27.5	152 56.2	28.9	347 39.2	24.5	248 44.0	39.0	56 38.1	27	22 33.1	+ 65
	5	124 48.5	253 31.9	26.7	167 56.9	28.3	2 41.6	24.5	263 46.2	39.1	70 59.8	26	22 39.6	+ 63
	6	139 51.0	268 35.7	−23 25.9	182 57.7	−18 27.7	17 44.0	+20 24.5	278 48.3	−13 39.2	85 21.4	26	+22 45.9	+ 61
	7	154 53.5	283 39.6	25.0	197 58.4	27.2	32 46.4	24.5	293 50.5	39.3	99 43.0	25	22 52.0	+ 60
	8	169 55.9	298 43.4	24.2	212 59.2	26.6	47 48.8	24.5	308 52.7	39.4	114 04.5	25	22 58.0	+ 58
	9	184 58.4	313 47.3	•• 23.4	227 59.9	•• 26.0	62 51.3	•• 24.5	323 54.8	•• 39.5	128 26.0	24	·23 03.8	+ 56
	10	200 00.9	328 51.1	22.5	243 00.7	25.5	77 53.7	24.5	338 57.0	39.5	142 47.4	24	23 09.4	+ 54
	11	215 03.3	343 55.0	21.7	258 01.5	24.9	92 56.1	24.5	353 59.2	39.6	157 08.8	24	23 14.8	+ 53
	12	230 05.8	358 58.8	−23 20.8	273 02.2	−18 24.3	107 58.5	+20 24.5	9 01.4	−13 39.7	171 30.2	23	+23 20.1	+ 51
	13	245 08.2	14 02.7	20.0	288 03.0	23.8	123 00.9	24.5	24 03.5	39.8	185 51.5	23	23 25.2	+ 49
	14	260 10.7	29 06.5	19.2	303 03.7	23.2	138 03.3	24.5	39 05.7	39.9	200 12.8	22	23 30.1	+ 47
	15	275 13.2	44 10.4	•• 18.3	318 04.5	•• 22.6	153 05.7	•• 24.5	54 07.9	•• 40.0	214 34.0	23	·23 34.8	+ 45
	16	290 15.6	59 14.2	17.5	333 05.2	22.1	168 08.2	24.4	69 10.0	40.1	228 55.3	22	23 39.3	+ 43
	17	305 18.1	74 18.1	16.6	348 06.0	21.5	183 10.6	24.4	84 12.2	40.2	243 16.5	22	23 43.6	+ 42
	18	320 20.6	89 21.9	−23 15.7	3 06.8	−18 20.9	198 13.0	+20 24.4	99 14.4	−13 40.3	257 37.7	22	+23 47.8	+ 39
	19	335 23.0	104 25.8	14.9	18 07.5	20.4	213 15.4	24.4	114 16.5	40.4	271 58.9	21	23 51.7	+ 38
	20	350 25.5	119 29.6	14.0	33 08.3	19.8	228 17.8	24.4	129 18.7	40.4	286 20.0	22	23 55.5	+ 36
	21	5 28.0	134 33.5	•• 13.2	48 09.0	•• 19.2	243 20.2	•• 24.4	144 20.9	•• 40.5	300 41.2	21	·23 59.1	+ 34
	22	20 30.4	149 37.3	12.3	63 09.8	18.6	258 22.7	24.4	159 23.1	40.6	315 02.3	21	24 02.5	+ 32
	23	35 32.9	164 41.2	11.5	78 10.5	18.1	273 25.1	24.4	174 25.2	40.7	329 23.4	21	24 05.7	+ 31
	24	50 35.4	179 45.1	−23 10.6	93 11.3	−18 17.5	288 27.5	+20 24.4	189 27.4	−13 40.8	343 44.5	22	+24 08.8	+ 28
code		—	+ 38	+ 8	+ 7	+ 6	+ 24	0	+ 21	− 1				

GMT		SUN GHA	SUN Dec.
	h	° ′	° ′
9	0	184 02.9	−16 38.8
	1	199 02.8	39.5
	2	214 02.8	40.2
	3	229 02.7 ••	40.9
	4	244 02.7	41.6
	5	259 02.6	42.4
	6	274 02.6	−16 43.1
	7	289 02.5	43.8
	8	304 02.5	44.5
	9	319 02.4 ••	45.2
	10	334 02.4	46.0
	11	349 02.4	46.7
	12	4 02.3	−16 47.4
	13	19 02.3	48.1
	14	34 02.2	48.8
	15	49 02.2 ••	49.6
	16	64 02.1	50.3
	17	79 02.1	51.0
	18	94 02.0	−16 51.7
	19	109 02.0	52.4
	20	124 01.9	53.1
	21	139 01.8 ••	53.8
	22	154 01.8	54.6
	23	169 01.7	55.3
10	0	184 01.7	−16 56.0
	1	199 01.6	56.7
	2	214 01.6	57.4
	3	229 01.5 ••	58.1
	4	244 01.5	58.8
	5	259 01.4	16 59.5
	6	274 01.4	−17 00.2
	7	289 01.3	00.9
	8	304 01.2	01.7
	9	319 01.2 ••	02.4
	10	334 01.1	03.1
	11	349 01.1	03.8
	12	4 01.0	−17 04.5
	13	19 01.0	05.2
	14	34 00.9	05.9
	15	49 00.8 ••	06.6
	16	64 00.8	07.3
	17	79 00.7	08.0
	18	94 00.7	−17 08.7
	19	109 00.6	09.4
	20	124 00.5	10.1
	21	139 00.5 ••	10.8
	22	154 00.4	11.5
	23	169 00.4	12.2
11	0	184 00.3	−17 12.9
	1	199 00.2	13.6
	2	214 00.2	14.3
	3	229 00.1 ••	15.0
	4	244 00.0	15.7
	5	259 00.0	16.4
	6	273 59.9	−17 17.1
	7	288 59.8	17.8
	8	303 59.8	18.5
	9	318 59.7 ••	19.2
	10	333 59.6	19.9
	11	348 59.6	20.6
	12	3 59.5	−17 21.3
	13	18 59.4	22.0
	14	33 59.4	22.7
	15	48 59.3 ••	23.4
	16	63 59.2	24.0
	17	78 59.2	24.7
	18	93 59.1	−17 25.4
	19	108 59.0	26.1
	20	123 59.0	26.8
	21	138 58.9 ••	27.5
	22	153 58.8	28.2
	23	168 58.8	28.9
	24	183 58.7	−17 29.6
code		—	− 7

STARS No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.1	−40 28.9
5	Achernar	335 58.7	−57 27.9
30	Acrux	173 59.2	−62 50.8
19	Adhara	255 46.8	−28 54.4
10	Aldebaran	291 39.5	+16 25.3
32	Alioth	166 59.5	+56 12.1
34	Alkaid	153 33.8	+49 32.1
55	Al Na'ir	28 38.6	−47 10.9
15	Alnilam	276 30.7	− 1 13.6
25	Alphard	218 39.3	− 8 27.6
41	Alphecca	126 48.5	+26 51.9
1	Alpheratz	358 28.8	+28 50.8
51	Altair	62 51.2	+ 8 45.0
2	Ankaa	353 58.6	−42 33.0
42	Antares	113 20.5	−26 20.0
37	Arcturus	146 36.1	+19 25.0
43	Atria	109 02.4	−68 57.0
22	Avior	234 35.9	−59 21.5
13	Bellatrix	279 18.9	+ 6 18.7
16	Betelg'se	271 48.6	+ 7 24.1
17	Canopus	264 15.3	−52 40.0
12	Capella	281 39.0	+45 57.3
53	Deneb	50 01.6	+45 07.4
28	Denebola	183 18.6	+14 49.4
4	Diphda	349 39.6	−18 13.9
27	Dubhe	194 45.6	+61 59.4
14	Elnath	279 07.9	+28 34.3
47	Eltanin	91 07.0	+51 29.8
54	Enif	34 30.2	+ 9 40.3
56	Fomalhaut	16 12.2	−29 51.7
31	Gacrux	172 50.5	−56 51.5
29	Gienah	176 37.8	−17 17.4
35	Hadar	149 51.1	−60 09.3
6	Hamal	328 50.1	+23 15.2
48	Kaus Aust.	84 42.3	−34 24.5
40	Kochab	137 19.0	+74 20.3
57	Markab	14 22.0	+14 58.0
8	Menkar	315 00.7	+ 3 55.0
36	Menkent	148 59.9	−36 08.9
24	Miapl'dus	221 49.3	−69 31.6
9	Mirfak	309 42.9	+49 42.3
50	Nunki	76 52.9	−26 21.3
52	Peacock	54 28.4	−56 53.1
21	Pollux	244 21.2	+28 08.1
20	Procyon	245 45.5	+ 5 20.6
46	R'alhague	96 47.5	+12 35.6
26	Regulus	208 30.3	+12 11.3
11	Rigel	281 54.0	− 8 15.0
38	Rigil Kent.	140 52.6	−60 39.1
44	Sabik	103 03.2	−15 40.2
3	Schedar	350 30.3	+56 17.7
45	Shaula	97 21.9	−37 04.4
18	Sirius	259 12.2	−16 39.0
33	Spica	159 17.9	−10 55.6
23	Suhail	223 24.8	−43 14.7
49	Vega	81 09.0	+38 44.7
39	Zub'g'bi	137 54.4	−15 51.3

Lat.	Sunrise	Twlt. begins	Moonrise 9	Moonrise 10	Moonrise 11	Moonrise 12
N °	h m	h m	h m	h m	h m	h m
72	9 58	5 17	12 28	□	□	□
70	9 16	5 17	13 07	□	□	□
68	8 48	5 17	13 34	13 07	□	□
66	8 26	5 17	13 55	13 49	13 38	□
64	8 10	5 17	14 12	14 17	14 31	15 12
62	7 56	5 16	14 26	14 39	15 04	15 53
60	7 44	5 15	14 38	14 57	15 28	16 21
58	7 34	5 15	14 49	15 12	15 48	16 43
56	7 25	5 14	14 58	15 25	16 04	17 01
54	7 17	5 13	15 06	15 36	16 18	17 16
52	7 10	5 12	15 14	15 46	16 31	17 29
50	7 04	5 11	15 20	15 55	16 41	17 40
45	6 50	5 08	15 34	16 14	17 04	18 04
40	6 39	5 05	15 46	16 30	17 22	18 24
35	6 29	5 01	15 56	16 43	17 38	18 40
30	6 21	4 58	16 05	16 55	17 51	18 54
20	6 06	4 50	16 21	17 15	18 14	19 17
10	5 53	4 40	16 34	17 32	18 34	19 38
0	5 40	4 28	16 47	17 48	18 53	19 57
10	5 28	4 14	17 00	18 05	19 11	20 17
20	5 15	3 56	17 14	18 23	19 31	20 37
30	4 59	3 31	17 30	18 43	19 55	21 01
35	4 50	3 15	17 40	18 55	20 08	21 15
40	4 40	2 53	17 51	19 09	20 24	21 31
45	4 27	2 26	18 03	19 26	20 43	21 51
50	4 12	1 45	18 19	19 46	21 07	22 15
52	4 05	1 20	18 26	19 56	21 19	22 27
54	3 58	0 41	18 35	20 07	21 32	22 40
56	3 49	////	18 44	20 20	21 47	22 55
58	3 39	////	18 54	20 34	22 05	23 14
60	3 28	////	19 06	20 52	22 26	23 36
S						

Lat.	Sunset	Twlt. ends	Moonset 9	Moonset 10	Moonset 11	Moonset 12
N °	h m	h m	h m	h m	h m	h m
72	13 28	18 06	8 12	□	□	□
70	14 11	18 06	7 35	□	□	□
68	14 39	18 07	7 09	9 42	□	□
66	15 00	18 07	6 49	9 02	11 26	□
64	15 17	18 08	6 34	8 34	10 33	12 09
62	15 31	18 09	6 21	8 13	10 00	11 28
60	15 43	18 10	6 10	7 55	9 36	11 00
58	15 53	18 10	6 00	7 41	9 17	10 38
56	16 02	18 12	5 52	7 29	9 01	10 20
54	16 10	18 13	5 45	7 18	8 47	10 05
52	16 17	18 14	5 38	7 09	8 35	9 52
50	16 23	18 14	5 32	7 00	8 25	9 40
45	16 37	18 18	5 20	6 42	8 03	9 16
40	16 49	18 22	5 09	6 28	7 45	8 57
35	16 58	18 25	5 00	6 16	7 30	8 41
30	17 07	18 29	4 53	6 05	7 17	8 27
20	17 22	18 38	4 39	5 46	6 55	8 03
10	17 35	18 48	4 28	5 31	6 36	7 43
0	17 47	18 59	4 17	5 16	6 19	7 23
10	18 00	19 14	4 06	5 01	6 01	7 04
20	18 13	19 32	3 54	4 45	5 42	6 44
30	18 29	19 58	3 41	4 27	5 20	6 20
35	18 38	20 14	3 34	4 17	5 07	6 06
40	18 49	20 36	3 25	4 05	4 53	5 50
45	19 01	21 04	3 15	3 51	4 35	5 30
50	19 16	21 47	3 03	3 34	4 14	5 06
52	19 23	22 13	2 57	3 26	4 04	4 55
54	19 31	22 56	2 51	3 17	3 52	4 41
56	19 40	////	2 45	3 07	3 39	4 26
58	19 50	////	2 37	2 56	3 24	4 08
60	20 02	////	2 29	2 43	3 06	3 46
S						

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.5	0.5	0.1
30			
	0.5	0.4	0.1
45			
	0.5	0.3	0.1
60			
	0.5	0.2	0.1
75			
	0.5	0.1	0.0
90			

Moon's Lower Limb Add

Alt.	9	10	11
°	′	′	′
0	21.0	21.1	21.0
4	21.0	21.1	21.0
8	21.0	21.1	21.0
12	20.9	21.0	20.9
16	20.8	20.9	20.8
20	20.7	20.8	20.7
24	20.6	20.7	20.6
28	20.4	20.6	20.4
32	20.3	20.4	20.3
36	20.1	20.2	20.1
40	19.9	20.0	19.9
44	19.7	19.8	19.7
48	19.5	19.6	19.5
52	19.2	19.3	19.2
56	19.0	19.1	19.0
60	18.7	18.8	18.7
64	18.5	18.5	18.5
68	18.2	18.3	18.2
72	17.9	18.0	17.9
76	17.6	17.7	17.6
80	17.3	17.4	17.3
84	17.0	17.1	17.0
88	16.8	16.8	16.8
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	9	10	11
°	′	′	′
0	12.4	12.4	12.4
4	12.5	12.4	12.5
8	12.5	12.4	12.5
12	12.5	12.5	12.5
16	12.6	12.6	12.6
20	12.7	12.7	12.7
24	12.9	12.8	12.9
28	13.0	12.9	13.0
32	13.2	13.2	13.2
36	13.3	13.3	13.3
40	13.5	13.5	13.5
44	13.7	13.7	13.7
48	14.0	13.9	14.0
52	14.2	14.2	14.2
56	14.4	14.4	14.4
60	14.7	14.7	14.7
64	15.0	15.0	15.0
68	15.2	15.2	15.2
72	15.5	15.5	15.5
76	15.8	15.8	15.8
80	16.1	16.1	16.1
84	16.4	16.4	16.4
88	16.6	16.7	16.6
90			

Subtract from table, back cover

GMT	Equation of Time (App.—Mean) 9	10	11
h	m s	m s	m s
0	+16 11.6	+16 06.9	+16 01.3
6	+16 10.5	+16 05.5	+15 59.8
12	+16 09.3	+16 04.2	+15 58.2
18	+16 08.1	+16 02.8	+15 56.6
24	+16 06.9	+16 01.3	+15 54.9

GMT of Transit Meridian of Greenwich DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
9	23 01	12 16	17 50	4 57	11 31
10	24 03	12 10	17 49	4 53	11 28
11	0 03	12 04	17 48	4 49	11 24
12	1 08	11 58	17 46	4 45	11 21

Full Moon 10
Armistice Day 11

GMT		♈ GHA	VENUS −3.2 GHA	VENUS Dec.	MARS 0.2 GHA	MARS Dec.	JUPITER −1.9 GHA	JUPITER Dec.	SATURN 0.7 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
12	0	50 35.4	179 45.1	−23 10.6	93 11.3	−18 17.5	288 27.5	+20 24.4	189 27.4	−13 40.8	343 44.5	22	+24 08.8	+28
	1	65 37.8	194 48.9	09.7	108 12.0	16.9	303 29.9	24.4	204 29.6	40.9	358 05.7	21	24 11.6	+27
	2	80 40.3	209 52.8	08.9	123 12.8	16.4	318 32.3	24.4	219 31.7	41.0	12 26.8	21	24 14.3	+24
	3	95 42.7	224 56.6	·· 08.0	138 13.6	·· 15.8	333 34.8	·· 24.4	234 33.9	·· 41.1	26 47.9	21	·24 16.7	+23
	4	110 45.2	240 00.5	07.1	153 14.3	15.2	348 37.2	24.4	249 36.1	41.2	41 09.0	22	24 19.0	+21
	5	125 47.7	255 04.4	06.3	168 15.1	14.6	3 39.6	24.4	264 38.3	41.3	55 30.2	21	24 21.1	+19
	6	140 50.1	270 08.2	−23 05.4	183 15.8	−18 14.1	18 42.0	+20 24.4	279 40.4	−13 41.3	69 51.3	22	+24 23.0	+17
	7	155 52.6	285 12.1	04.5	198 16.6	13.5	33 44.4	24.4	294 42.6	41.4	84 12.5	21	24 24.7	+16
	8	170 55.1	300 16.0	03.7	213 17.3	12.9	48 46.9	24.4	309 44.8	41.5	98 33.6	22	24 26.3	+13
	9	185 57.5	315 19.8	·· 02.8	228 18.1	·· 12.4	63 49.3	·· 24.4	324 46.9	·· 41.6	112 54.8	23	·24 27.6	+11
	10	201 00.0	330 23.7	01.9	243 18.9	11.8	78 51.7	24.4	339 49.1	41.7	127 16.1	22	24 28.7	+10
	11	216 02.5	345 27.6	01.0	258 19.6	11.2	93 54.1	24.4	354 51.3	41.8	141 37.3	23	24 29.7	+8
	12	231 04.9	0 31.4	−23 00.1	273 20.4	−18 10.6	108 56.5	+20 24.4	9 53.4	−13 41.9	155 58.6	23	+24 30.5	+6
	13	246 07.4	15 35.3	22 59.3	288 21.1	10.1	123 59.0	24.4	24 55.6	42.0	170 19.9	23	24 31.1	+4
	14	261 09.9	30 39.2	58.4	303 21.9	09.5	139 01.4	24.4	39 57.8	42.1	184 41.2	24	24 31.5	+2
	15	276 12.3	45 43.1	·· 57.5	318 22.6	·· 08.9	154 03.8	·· 24.4	55 00.0	·· 42.1	199 02.6	24	·24 31.7	0
	16	291 14.8	60 46.9	56.6	333 23.4	08.3	169 06.2	24.4	70 02.1	42.2	213 24.0	24	24 31.7	−2
	17	306 17.2	75 50.8	55.7	348 24.2	07.8	184 08.7	24.4	85 04.3	42.3	227 45.4	25	24 31.5	−3
	18	321 19.7	90 54.7	−22 54.8	3 24.9	−18 07.2	199 11.1	+20 24.4	100 06.5	−13 42.4	242 06.9	25	+24 31.2	−5
	19	336 22.2	105 58.6	53.9	18 25.7	06.6	214 13.5	24.4	115 08.6	42.5	256 28.4	26	24 30.7	−7
	20	351 24.6	121 02.4	53.1	33 26.4	06.0	229 15.9	24.4	130 10.8	42.6	270 50.0	26	24 30.0	−9
	21	6 27.1	136 06.3	·· 52.2	48 27.2	·· 05.5	244 18.4	·· 24.4	145 13.0	·· 42.7	285 11.6	27	·24 29.1	−11
	22	21 29.6	151 10.2	51.3	63 27.9	04.9	259 20.8	24.4	160 15.2	42.8	299 33.3	28	24 28.0	−13
	23	36 32.0	166 14.1	50.4	78 28.7	04.3	274 23.2	24.4	175 17.3	42.9	313 55.1	28	24 26.7	−14
13	0	51 34.5	181 18.0	−22 49.5	93 29.5	−18 03.7	289 25.6	+20 24.4	190 19.5	−13 43.0	328 16.9	28	+24 25.3	−16
	1	66 37.0	196 21.8	48.6	108 30.2	03.1	304 28.1	24.4	205 21.7	43.0	342 38.7	30	24 23.7	−18
	2	81 39.4	211 25.7	47.7	123 31.0	02.6	319 30.5	24.4	220 23.8	43.1	357 00.7	29	24 21.9	−20
	3	96 41.9	226 29.6	·· 46.8	138 31.7	·· 02.0	334 32.9	·· 24.4	235 26.0	·· 43.2	11 22.6	31	·24 19.9	−21
	4	111 44.4	241 33.5	45.9	153 32.5	01.4	349 35.4	24.4	250 28.2	43.3	25 44.7	31	24 17.8	−24
	5	126 46.8	256 37.4	45.0	168 33.2	00.8	4 37.8	24.4	265 30.4	43.4	40 06.8	32	24 15.4	−25
	6	141 49.3	271 41.2	−22 44.1	183 34.0	−18 00.3	19 40.2	+20 24.4	280 32.5	−13 43.5	54 29.0	33	+24 12.9	−26
	7	156 51.7	286 45.1	43.2	198 34.8	17 59.7	34 42.6	24.4	295 34.7	43.6	68 51.3	33	24 10.3	−29
	8	171 54.2	301 49.0	42.3	213 35.5	59.1	49 45.1	24.4	310 36.9	43.7	83 13.6	35	24 07.4	−30
	9	186 56.7	316 52.9	·· 41.3	228 36.3	·· 58.5	64 47.5	·· 24.4	325 39.0	·· 43.8	97 36.1	35	·24 04.4	−32
	10	201 59.1	331 56.8	40.4	243 37.0	57.9	79 49.9	24.4	340 41.2	43.8	111 58.6	36	24 01.2	−33
	11	217 01.6	347 00.6	39.5	258 37.8	57.4	94 52.4	24.4	355 43.4	43.9	126 21.2	36	23 57.9	−35
	12	232 04.1	2 04.5	−22 38.6	273 38.5	−17 56.8	109 54.8	+20 24.4	10 45.5	−13 44.0	140 43.8	38	+23 54.4	−37
	13	247 06.5	17 08.4	37.7	288 39.3	56.2	124 57.2	24.4	25 47.7	44.1	155 06.6	38	23 50.7	−39
	14	262 09.0	32 12.3	36.8	303 40.1	55.6	139 59.7	24.4	40 49.9	44.2	169 29.4	40	23 46.8	−40
	15	277 11.5	47 16.2	·· 35.9	318 40.8	·· 55.0	155 02.1	·· 24.4	55 52.1	·· 44.3	183 52.4	40	·23 42.8	−42
	16	292 13.9	62 20.1	34.9	333 41.6	54.5	170 04.5	24.4	70 54.2	44.4	198 15.4	41	23 38.6	−43
	17	307 16.4	77 24.0	34.0	348 42.3	53.9	185 07.0	24.4	85 56.4	44.5	212 38.5	42	23 34.3	−45
	18	322 18.9	92 27.8	−22 33.1	3 43.1	−17 53.3	200 09.4	+20 24.4	100 58.6	−13 44.6	227 01.7	43	+23 29.8	−47
	19	337 21.3	107 31.7	32.2	18 43.8	52.7	215 11.8	24.4	116 00.7	44.6	241 25.0	44	23 25.1	−48
	20	352 23.8	122 35.6	31.3	33 44.6	52.1	230 14.3	24.4	131 02.9	44.7	255 48.4	46	23 20.3	−49
	21	7 26.2	137 39.5	·· 30.3	48 45.4	·· 51.5	245 16.7	·· 24.4	146 05.1	·· 44.8	270 12.0	46	·23 15.4	−52
	22	22 28.7	152 43.4	29.4	63 46.1	51.0	260 19.1	24.4	161 07.3	44.9	284 35.6	47	23 10.2	−52
	23	37 31.2	167 47.3	28.5	78 46.9	50.4	275 21.6	24.4	176 09.4	45.0	298 59.3	48	23 05.0	−55
14	0	52 33.6	182 51.2	−22 27.6	93 47.6	−17 49.8	290 24.0	+20 24.4	191 11.6	−13 45.1	313 23.1	49	+22 59.5	−55
	1	67 36.1	197 55.1	26.6	108 48.4	49.2	305 26.4	24.4	206 13.8	45.2	327 47.0	50	22 54.0	−57
	2	82 38.6	212 58.9	25.7	123 49.2	48.6	320 28.9	24.4	221 15.9	45.3	342 11.0	51	22 48.3	−59
	3	97 41.0	228 02.8	·· 24.8	138 49.9	·· 48.0	335 31.3	·· 24.4	236 18.1	·· 45.4	356 35.1	53	·22 42.4	−60
	4	112 43.5	243 06.7	23.8	153 50.7	47.5	350 33.7	24.4	251 20.3	45.4	10 59.4	53	22 36.4	−62
	5	127 46.0	258 10.6	22.9	168 51.4	46.9	5 36.2	24.4	266 22.5	45.5	25 23.7	55	22 30.2	−63
	6	142 48.4	273 14.5	−22 22.0	183 52.2	−17 46.3	20 38.6	+20 24.4	281 24.6	−13 45.6	39 48.2	55	+22 23.9	−64
	7	157 50.9	288 18.4	21.0	198 52.9	45.7	35 41.1	24.4	296 26.8	45.7	54 12.7	57	22 17.5	−66
	8	172 53.3	303 22.2	20.1	213 53.7	45.1	50 43.5	24.4	311 29.0	45.8	68 37.4	58	22 10.9	−67
	9	187 55.8	318 26.1	·· 19.2	228 54.5	·· 44.5	65 45.9	·· 24.4	326 31.1	·· 45.9	83 02.2	59	·22 04.2	−68
	10	202 58.3	333 30.0	18.2	243 55.2	44.0	80 48.4	24.4	341 33.3	46.0	97 27.1	60	21 57.4	−70
	11	218 00.7	348 33.9	17.3	258 56.0	43.4	95 50.8	24.4	356 35.5	46.1	111 52.1	61	21 50.4	−71
	12	233 03.2	3 37.8	−22 16.3	273 56.7	−17 42.8	110 53.2	+20 24.4	11 37.7	−13 46.2	126 17.2	62	+21 43.3	−72
	13	248 05.7	18 41.7	15.4	288 57.5	42.2	125 55.7	24.4	26 39.8	46.2	140 42.4	64	21 36.1	−74
	14	263 08.1	33 45.6	14.5	303 58.3	41.6	140 58.1	24.4	41 42.0	46.3	155 07.8	65	21 28.7	−74
	15	278 10.6	48 49.5	·· 13.5	318 59.0	·· 41.0	156 00.6	·· 24.4	56 44.2	·· 46.4	169 33.3	65	·21 21.3	−76
	16	293 13.1	63 53.3	12.6	333 59.8	40.4	171 03.0	24.4	71 46.3	46.5	183 58.8	67	21 13.7	−78
	17	308 15.5	78 57.2	11.6	349 00.5	39.9	186 05.5	24.4	86 48.5	46.6	198 24.5	69	21 05.9	−78
	18	323 18.0	94 01.1	−22 10.7	4 01.3	−17 39.3	201 07.9	+20 24.4	101 50.7	−13 46.7	212 50.4	69	+20 58.1	−80
	19	338 20.5	109 05.0	09.7	19 02.0	38.7	216 10.3	24.4	116 52.8	46.8	227 16.3	70	20 50.1	−81
	20	353 22.9	124 08.9	08.8	34 02.8	38.1	231 12.8	24.4	131 55.0	46.9	241 42.3	72	20 42.0	−82
	21	8 25.4	139 12.8	·· 07.8	49 03.6	·· 37.5	246 15.2	·· 24.4	146 57.2	·· 47.0	256 08.5	73	·20 33.8	−83
	22	23 27.8	154 16.7	06.9	64 04.3	36.9	261 17.7	24.5	161 59.4	47.0	270 34.8	74	20 25.5	−84
	23	38 30.3	169 20.5	05.9	79 05.1	36.3	276 20.1	24.5	177 01.5	47.1	285 01.2	75	20 17.1	−86
	24	53 32.8	184 24.4	−22 05.0	94 05.8	−17 35.7	291 22.6	+20 24.5	192 03.7	−13 47.2	299 27.7	77	+20 08.5	−86
code		–	+39	+9	+8	+6	+24	0	+22	−1				

GMT		SUN GHA		Dec.
	h	° ′		° ′
12	0	183 58.7	−17	29.6
	1	198 58.6		30.2
	2	213 58.5		30.9
	3	228 58.5	••	31.6
	4	243 58.4		32.3
	5	258 58.3		33.0
	6	273 58.2	−17	33.7
	7	288 58.2		34.4
	8	303 58.1		35.0
	9	318 58.0	••	35.7
	10	333 58.0		36.4
	11	348 57.9		37.1
	12	3 57.8	−17	37.8
	13	18 57.7		38.4
	14	33 57.6		39.1
	15	48 57.6	••	39.8
	16	63 57.5		40.5
	17	78 57.4		41.2
	18	93 57.3	−17	41.8
	19	108 57.3		42.5
	20	123 57.2		43.2
	21	138 57.1	••	43.9
	22	153 57.0		44.5
	23	168 56.9		45.2
13	0	183 56.9	−17	45.9
	1	198 56.8		46.6
	2	213 56.7		47.2
	3	228 56.6	••	47.9
	4	243 56.5		48.6
	5	258 56.5		49.3
	6	273 56.4	−17	49.9
	7	288 56.3		50.6
	8	303 56.2		51.3
	9	318 56.1	••	51.9
	10	333 56.0		52.6
	11	348 56.0		53.3
	12	3 55.9	−17	54.0
	13	18 55.8		54.6
	14	33 55.7		55.3
	15	48 55.6	••	56.0
	16	63 55.5		56.6
	17	78 55.4		57.3
	18	93 55.4	−17	58.0
	19	108 55.3		58.6
	20	123 55.2		59.3
	21	138 55.1	·17	59.9
	22	153 55.0	18	00.6
	23	168 54.9		01.3
14	0	183 54.8	−18	01.9
	1	198 54.7		02.6
	2	213 54.6		03.3
	3	228 54.6	••	03.9
	4	243 54.5		04.6
	5	258 54.4		05.2
	6	273 54.3	−18	05.9
	7	288 54.2		06.5
	8	303 54.1		07.2
	9	318 54.0	••	07.9
	10	333 53.9		08.5
	11	348 53.8		09.2
	12	3 53.7	−18	09.8
	13	18 53.6		10.5
	14	33 53.5		11.1
	15	48 53.4	••	11.8
	16	63 53.3		12.4
	17	78 53.3		13.1
	18	93 53.2	−18	13.7
	19	108 53.1		14.4
	20	123 53.0		15.1
	21	138 52.9	••	15.7
	22	153 52.8		16.4
	23	168 52.7		17.0
	24	183 52.6	−18	17.6
code		—		− 6

STARS No.	Name	SHA ° ′	Dec. ° ′
7	Acamar	315 51.1	−40 29.0
5	Achernar	335 58.7	−57 27.9
30	Acrux	173 59.1	−62 50.8
19	Adhara	255 46.8	−28 54.4
10	Aldebaran	291 39.5	+16 25.3
32	Alioth	166 59.5	+56 12.0
34	Alkaid	153 33.8	+49 32.1
55	Al Na'ir	28 38.7	−47 10.9
15	Alnilam	276 30.7	− 1 13.6
25	Alphard	218 39.2	− 8 27.7
41	Alphecca	126 48.5	+26 51.9
1	Alpheratz	358 28.8	+28 50.8
51	Altair	62 51.2	+ 8 45.0
2	Ankaa	353 58.6	−42 33.0
42	Antares	113 20.5	−26 20.0
37	Arcturus	146 36.1	+19 24.9
43	Atria	109 02.4	−68 57.0
22	Avior	234 35.9	−59 21.5
13	Bellatrix	279 18.8	+ 6 18.7
16	Betelg'se	271 48.6	+ 7 24.1
17	Canopus	264 15.3	−52 40.0
12	Capella	281 39.0	+45 57.3
53	Deneb	50 01.6	+45 07.4
28	Denebola	183 18.6	+14 49.4
4	Diphda	349 39.6	−18 13.9
27	Dubhe	194 45.6	+61 59.4
14	Elnath	279 07.8	+28 34.3
47	Eltanin	91 07.0	+51 29.8
54	Enif	34 30.2	+ 9 40.3
56	Fomalhaut	16 12.2	−29 51.7
31	Gacrux	172 50.5	−56 51.5
29	Gienah	176 37.8	−17 17.4
35	Hadar	149 51.0	−60 09.3
6	Hamal	328 50.1	+23 15.2
48	Kaus Aust.	84 42.3	−34 24.5
40	Kochab	137 19.0	+74 20.3
57	Markab	14 22.0	+14 58.0
8	Menkar	315 00.7	+ 3 55.0
36	Menkent	148 59.9	−36 08.9
24	Miapl'dus	221 49.2	−69 31.6
9	Mirfak	309 42.8	+49 42.3
50	Nunki	76 52.9	−26 21.3
52	Peacock	54 28.5	−56 53.1
21	Pollux	244 21.2	+28 08.1
20	Procyon	245 45.5	+ 5 20.6
46	R'alhague	96 47.5	+12 35.6
26	Regulus	208 30.2	+12 11.2
11	Rigel	281 54.0	− 8 15.0
38	Rigil Kent.	140 52.6	−60 39.0
44	Sabik	103 03.2	−15 40.2
3	Schedar	350 30.4	+56 17.8
45	Shaula	97 21.9	−37 04.4
18	Sirius	259 12.2	−16 39.0
33	Spica	159 17.9	−10 55.6
23	Suhail	223 24.8	−43 14.7
49	Vega	81 09.0	+38 44.6
39	Zub'g'bi	137 54.4	−15 51.3

Lat.	Sunrise	Twlt. begins	Moonrise 12	13	14	15
N °	h m	h m	h m	h m	h m	h m
72	10 28	5 28	▭	▭	▭	17 53
70	9 34	5 27	▭	▭	▭	18 54
68	9 01	5 26	▭	▭	17 02	19 29
66	8 38	5 25	▭	15 35	17 53	19 54
64	8 19	5 24	15 12	16 38	18 25	20 13
62	8 04	5 23	15 53	17 12	18 49	20 28
60	7 52	5 21	16 21	17 37	19 08	20 42
58	7 41	5 21	16 43	17 57	19 24	20 53
56	7 31	5 19	17 01	18 14	19 37	21 02
54	7 23	5 18	17 16	18 28	19 48	21 11
52	7 16	5 17	17 29	18 40	19 59	21 18
50	7 09	5 15	17 40	18 51	20 08	21 25
45	6 54	5 12	18 04	19 13	20 27	21 40
40	6 42	5 08	18 24	19 31	20 42	21 52
35	6 32	5 04	18 40	19 47	20 55	22 02
30	6 23	5 00	18 54	20 00	21 06	22 11
20	6 07	4 51	19 17	20 22	21 26	22 26
10	5 54	4 40	19 38	20 42	21 43	22 39
0	5 41	4 29	19 57	21 00	21 58	22 52
10	5 28	4 14	20 17	21 18	22 14	23 04
20	5 14	3 55	20 37	21 37	22 31	23 17
30	4 57	3 29	21 01	22 00	22 50	23 32
35	4 48	3 11	21 15	22 13	23 01	23 41
40	4 37	2 50	21 31	22 28	23 13	23 51
45	4 24	2 20	21 51	22 46	23 28	24 02
50	4 08	1 36	22 15	23 08	23 47	24 16
52	4 01	1 07	22 27	23 18	23 55	24 22
54	3 53	0 12	22 40	23 30	24 05	0 05
56	3 43	////	22 55	23 43	24 15	0 15
58	3 33	////	23 14	23 59	24 28	0 28
60	3 20	////	23 36	24 18	0 18	0 42
S						

Lat.	Sunset	Twlt. ends	Moonset 12	13	14	15
N °	h m	h m	h m	h m	h m	h m
72	12 59	17 56	▭	▭	▭	15 43
70	13 54	17 58	▭	▭	▭	14 40
68	14 26	17 59	▭	▭	14 38	14 04
66	14 50	18 01	▭	13 59	13 45	13 38
64	15 08	18 01	12 09	12 56	13 12	13 17
62	15 23	18 03	11 28	12 21	12 48	13 01
60	15 36	18 04	11 00	11 55	12 28	12 47
58	15 47	18 06	10 38	11 35	12 12	12 35
56	15 56	18 07	10 20	11 18	11 58	12 25
54	16 05	18 09	10 05	11 04	11 46	12 16
52	16 12	18 10	9 52	10 52	11 36	12 08
50	16 19	18 11	9 40	10 41	11 26	12 00
45	16 34	18 15	9 16	10 17	11 06	11 44
40	16 46	18 19	8 57	9 59	10 50	11 31
35	16 56	18 23	8 41	9 43	10 36	11 20
30	17 05	18 27	8 27	9 30	10 24	11 10
20	17 21	18 37	8 03	9 07	10 03	10 53
10	17 35	18 48	7 43	8 46	9 45	10 38
0	17 48	19 00	7 23	8 28	9 28	10 24
10	18 01	19 15	7 04	8 09	9 11	10 10
20	18 15	19 35	6 44	7 48	8 53	9 55
30	18 32	20 02	6 20	7 25	8 32	9 38
35	18 41	20 18	6 06	7 11	8 19	9 27
40	18 52	20 41	5 50	6 55	8 05	9 16
45	19 05	21 11	5 30	6 36	7 48	9 02
50	19 21	21 57	5 06	6 12	7 26	8 45
52	19 29	22 28	4 55	6 00	7 16	8 36
54	19 37	////	4 41	5 47	7 05	8 27
56	19 47	////	4 26	5 32	6 51	8 17
58	19 57	////	4 08	5 14	6 36	8 05
60	20 10	////	3 46	4 52	6 18	7 52
S						

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.5	0.5	0.1
30			
	0.5	0.4	0.1
45			
	0.5	0.3	0.1
60			
	0.5	0.2	0.1
75			
	0.5	0.1	0.0
90			

Moon's Lower Limb
Add

Alt.	12	13	14
°	′	′	′
0			
	20.5	19.5	18.3
4			
	20.5	19.5	18.3
8			
	20.5	19.5	18.3
12			
	20.4	19.4	18.3
16			
	20.3	19.3	18.2
20			
	20.2	19.3	18.2
24			
	20.1	19.2	18.1
28			
	20.0	19.1	18.1
32			
	19.8	19.0	18.0
36			
	19.7	18.8	17.9
40			
	19.5	18.7	17.8
44			
	19.3	18.5	17.7
48			
	19.1	18.4	17.6
52			
	18.9	18.2	17.4
56			
	18.7	18.0	17.3
60			
	18.4	17.9	17.2
64			
	18.2	17.7	17.0
68			
	17.9	17.5	16.9
72			
	17.7	17.2	16.8
76			
	17.4	17.0	16.6
80			
	17.2	16.8	16.5
84			
	16.9	16.6	16.3
88			
	16.7	16.4	16.2
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	12	13	14
°	′	′	′
0			
	12.7	13.3	14.0
4			
	12.7	13.3	14.0
8			
	12.8	13.3	14.0
12			
	12.8	13.4	14.0
16			
	12.9	13.4	14.1
20			
	13.0	13.5	14.1
24			
	13.1	13.6	14.2
28			
	13.2	13.7	14.2
32			
	13.4	13.8	14.3
36			
	13.5	14.0	14.4
40			
	13.7	14.1	14.5
44			
	13.9	14.2	14.6
48			
	14.1	14.4	14.7
52			
	14.3	14.6	14.9
56			
	14.5	14.8	15.0
60			
	14.8	14.9	15.1
64			
	15.0	15.1	15.3
68			
	15.3	15.3	15.4
72			
	15.5	15.5	15.5
76			
	15.8	15.7	15.7
80			
	16.1	16.0	15.8
84			
	16.3	16.2	16.0
88			
	16.5	16.3	16.1
90			

Subtract from table, back cover

GMT	Equation of Time (App.—Mean) 12	13	14
h	m s	m s	m s
0	+15 54.9	+15 47.6	+15 39.5
6	+15 53.1	+15 45.7	+15 37.3
12	+15 51.4	+15 43.7	+15 35.1
18	+15 49.5	+15 41.6	+15 32.8
24	+15 47.6	+15 39.5	+15 30.5

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
12	1 08	11 58	17 46	4 45	11 21
13	2 13	11 52	17 45	4 42	11 17
14	3 14	11 46	17 44	4 38	11 14
15	4 11	11 39	17 43	4 34	11 10

GMT		♈	VENUS −3.0		MARS 0.3		JUPITER −1.9		SATURN 0.7		MOON			
		GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
15	0	53 32.8	184 24.4	−22 05.0	94 05.8	−17 35.7	291 22.6	+20 24.5	192 03.7	−13 47.2	299 27.7	77	+20 08.5	−86
	1	68 35.2	199 28.3	04.0	109 06.6	35.1	306 25.0	24.5	207 05.9	47.3	313 54.4	77	19 59.9	−88
	2	83 37.7	214 32.2	03.0	124 07.4	34.6	321 27.4	24.5	222 08.0	47.4	328 21.1	79	19 51.1	−88
	3	98 40.2	229 36.1	·· 02.1	139 08.1	·· 34.0	336 29.9	·· 24.5	237 10.2	·· 47.5	342 48.0	80	·19 42.3	−90
	4	113 42.6	244 40.0	01.1	154 08.9	33.4	351 32.3	24.5	252 12.4	47.6	357 15.0	81	19 33.3	−91
	5	128 45.1	259 43.8	22 00.2	169 09.6	32.8	6 34.8	24.5	267 14.6	47.7	11 42.1	82	19 24.2	−91
	6	143 47.6	274 47.7	−21 59.2	184 10.4	−17 32.2	21 37.2	+20 24.5	282 16.7	−13 47.7	26 09.3	84	+19 15.1	−93
	7	158 50.0	289 51.6	58.3	199 11.2	31.6	36 39.7	24.5	297 18.9	47.8	40 36.7	84	19 05.8	−94
	8	173 52.5	304 55.5	57.3	214 11.9	31.0	51 42.1	24.5	312 21.1	47.9	55 04.1	86	18 56.4	−94
	9	188 55.0	319 59.4	·· 56.3	229 12.7	·· 30.4	66 44.6	·· 24.5	327 23.2	·· 48.0	69 31.7	87	·18 47.0	−96
	10	203 57.4	335 03.2	55.4	244 13.4	29.8	81 47.0	24.5	342 25.4	48.1	83 59.4	88	18 37.4	−96
	11	218 59.9	350 07.1	54.4	259 14.2	29.2	96 49.5	24.5	357 27.6	48.2	98 27.2	89	18 27.8	−97
	12	234 02.3	5 11.0	−21 53.4	274 15.0	−17 28.6	111 51.9	+20 24.5	12 29.8	−13 48.3	112 55.1	90	+18 18.1	−99
	13	249 04.8	20 14.9	52.5	289 15.7	28.1	126 54.4	24.5	27 31.9	48.4	127 23.1	92	18 08.2	−99
	14	264 07.3	35 18.8	51.5	304 16.5	27.5	141 56.8	24.5	42 34.1	48.5	141 51.3	93	17 58.3	−100
	15	279 09.7	50 22.6	·· 50.5	319 17.2	·· 26.9	156 59.3	·· 24.5	57 36.3	·· 48.5	156 19.6	93	·17 48.3	−101
	16	294 12.2	65 26.5	49.6	334 18.0	26.3	172 01.7	24.5	72 38.4	48.6	170 47.9	95	17 38.2	−101
	17	309 14.7	80 30.4	48.6	349 18.7	25.7	187 04.2	24.5	87 40.6	48.7	185 16.4	96	17 28.1	−103
	18	324 17.1	95 34.3	−21 47.6	4 19.5	−17 25.1	202 06.6	+20 24.5	102 42.8	−13 48.8	199 45.0	98	+17 17.8	−103
	19	339 19.6	110 38.1	46.7	19 20.3	24.5	217 09.1	24.5	117 45.0	48.9	214 13.8	98	17 07.5	−104
	20	354 22.1	125 42.0	45.7	34 21.0	23.9	232 11.5	24.5	132 47.1	49.0	228 42.6	99	16 57.1	−105
	21	9 24.5	140 45.9	·· 44.7	49 21.8	·· 23.3	247 14.0	·· 24.5	147 49.3	·· 49.1	243 11.5	101	·16 46.6	−105
	22	24 27.0	155 49.8	43.8	64 22.5	22.7	262 16.4	24.5	162 51.5	49.2	257 40.6	101	16 36.1	−107
	23	39 29.5	170 53.6	42.8	79 23.3	22.1	277 18.9	24.5	177 53.6	49.2	272 09.7	103	16 25.4	−107
16	0	54 31.9	185 57.5	−21 41.8	94 24.1	−17 21.5	292 21.3	+20 24.5	192 55.8	−13 49.3	286 39.0	103	+16 14.7	−107
	1	69 34.4	201 01.4	40.8	109 24.8	20.9	307 23.8	24.6	207 58.0	49.4	301 08.3	105	16 04.0	−109
	2	84 36.8	216 05.2	39.8	124 25.6	20.3	322 26.2	24.6	223 00.2	49.5	315 37.8	106	15 53.1	−109
	3	99 39.3	231 09.1	·· 38.9	139 26.3	·· 19.7	337 28.7	·· 24.6	238 02.3	·· 49.6	330 07.4	107	·15 42.2	−110
	4	114 41.8	246 13.0	37.9	154 27.1	19.1	352 31.1	24.6	253 04.5	49.7	344 37.1	108	15 31.2	−110
	5	129 44.2	261 16.8	36.9	169 27.9	18.5	7 33.6	24.6	268 06.7	49.8	359 06.9	109	15 20.2	−111
	6	144 46.7	276 20.7	−21 35.9	184 28.6	−17 17.9	22 36.0	+20 24.6	283 08.8	−13 49.9	13 36.8	110	+15 09.1	−112
	7	159 49.2	291 24.6	35.0	199 29.4	17.4	37 38.5	24.6	298 11.0	50.0	28 06.8	111	14 57.9	−112
	8	174 51.6	306 28.4	34.0	214 30.1	16.8	52 40.9	24.6	313 13.2	50.0	42 36.9	112	14 46.7	−113
	9	189 54.1	321 32.3	·· 33.0	229 30.9	·· 16.2	67 43.4	·· 24.6	328 15.4	·· 50.1	57 07.1	113	·14 35.4	−113
	10	204 56.6	336 36.2	32.0	244 31.7	15.6	82 45.9	24.6	343 17.5	50.2	71 37.4	114	14 24.1	−114
	11	219 59.0	351 40.0	31.0	259 32.4	15.0	97 48.3	24.6	358 19.7	50.3	86 07.8	115	14 12.7	−115
	12	235 01.5	6 43.9	−21 30.1	274 33.2	−17 14.4	112 50.8	+20 24.6	13 21.9	−13 50.4	100 38.3	116	+14 01.2	−115
	13	250 03.9	21 47.7	29.1	289 33.9	13.8	127 53.2	24.6	28 24.0	50.5	115 08.9	117	13 49.7	−116
	14	265 06.4	36 51.6	28.1	304 34.7	13.2	142 55.7	24.6	43 26.2	50.6	129 39.6	117	13 38.1	−116
	15	280 08.9	51 55.5	·· 27.1	319 35.5	·· 12.6	157 58.1	·· 24.6	58 28.4	·· 50.7	144 10.3	119	·13 26.5	−117
	16	295 11.3	66 59.3	26.1	334 36.2	12.0	173 00.6	24.6	73 30.6	50.7	158 41.2	120	13 14.8	−117
	17	310 13.8	82 03.2	25.1	349 37.0	11.4	188 03.1	24.6	88 32.7	50.8	173 12.2	121	13 03.1	−117
	18	325 16.3	97 07.0	−21 24.1	4 37.7	−17 10.8	203 05.5	+20 24.6	103 34.9	−13 50.9	187 43.3	121	+12 51.4	−118
	19	340 18.7	112 10.9	23.2	19 38.5	10.2	218 08.0	24.7	118 37.1	51.0	202 14.4	123	12 39.6	−119
	20	355 21.2	127 14.7	22.2	34 39.3	09.6	233 10.4	24.7	133 39.3	51.1	216 45.7	123	12 27.7	−119
	21	10 23.7	142 18.6	·· 21.2	49 40.0	·· 09.0	248 12.9	·· 24.7	148 41.4	·· 51.2	231 17.0	124	·12 15.8	−119
	22	25 26.1	157 22.4	20.2	64 40.8	08.4	263 15.4	24.7	163 43.6	51.3	245 48.4	125	12 03.9	−120
	23	40 28.6	172 26.3	19.2	79 41.5	07.8	278 17.8	24.7	178 45.8	51.4	260 19.9	126	11 51.9	−120
17	0	55 31.1	187 30.1	−21 18.2	94 42.3	−17 07.2	293 20.3	+20 24.7	193 47.9	−13 51.4	274 51.5	127	+11 39.9	−121
	1	70 33.5	202 34.0	17.2	109 43.1	06.6	308 22.7	24.7	208 50.1	51.5	289 23.2	127	11 27.8	−121
	2	85 36.0	217 37.8	16.2	124 43.8	06.0	323 25.2	24.7	223 52.3	51.6	303 54.9	129	11 15.7	−121
	3	100 38.4	232 41.7	·· 15.2	139 44.6	·· 05.4	338 27.7	·· 24.7	238 54.5	·· 51.7	318 26.8	129	·11 03.6	−122
	4	115 40.9	247 45.5	14.2	154 45.4	04.8	353 30.1	24.7	253 56.6	51.8	332 58.7	130	10 51.4	−122
	5	130 43.4	262 49.3	13.3	169 46.1	04.2	8 32.6	24.7	268 58.8	51.9	347 30.7	131	10 39.2	−122
	6	145 45.8	277 53.2	−21 12.3	184 46.9	−17 03.6	23 35.1	+20 24.7	284 01.0	−13 52.0	2 02.8	132	+10 27.0	−123
	7	160 48.3	292 57.0	11.3	199 47.6	03.0	38 37.5	24.7	299 03.1	52.1	16 35.0	132	10 14.7	−123
	8	175 50.8	308 00.9	10.3	214 48.4	02.4	53 40.0	24.7	314 05.3	52.1	31 07.2	133	10 02.4	−123
	9	190 53.2	323 04.7	·· 09.3	229 49.2	·· 01.8	68 42.5	·· 24.7	329 07.5	·· 52.2	45 39.5	134	· 9 50.1	−124
	10	205 55.7	338 08.5	08.3	244 49.9	01.2	83 44.9	24.8	344 09.7	52.3	60 11.9	135	9 37.7	−124
	11	220 58.2	353 12.4	07.3	259 50.7	17 00.6	98 47.4	24.8	359 11.8	52.4	74 44.4	135	9 25.3	−124
	12	236 00.6	8 16.2	−21 06.3	274 51.4	−16 59.9	113 49.8	+20 24.8	14 14.0	−13 52.5	89 16.9	136	+ 9 12.9	−125
	13	251 03.1	23 20.0	05.3	289 52.2	59.3	128 52.3	24.8	29 16.2	52.6	103 49.5	137	9 00.4	−124
	14	266 05.5	38 23.9	04.3	304 53.0	58.7	143 54.8	24.8	44 18.3	52.7	118 22.2	137	8 48.0	−125
	15	281 08.0	53 27.7	·· 03.3	319 53.7	·· 58.1	158 57.2	·· 24.8	59 20.5	·· 52.8	132 54.9	138	· 8 35.5	−125
	16	296 10.5	68 31.5	02.3	334 54.5	57.5	173 59.7	24.8	74 22.7	52.8	147 27.7	139	8 23.0	−126
	17	311 12.9	83 35.3	01.3	349 55.2	56.9	189 02.2	24.8	89 24.9	52.9	162 00.6	140	8 10.4	−125
	18	326 15.4	98 39.2	−21 00.3	4 56.0	−16 56.3	204 04.6	+20 24.8	104 27.0	−13 53.0	176 33.6	140	+ 7 57.9	−126
	19	341 17.9	113 43.0	20 59.3	19 56.8	55.7	219 07.1	24.8	119 29.2	53.1	191 06.6	140	7 45.3	−126
	20	356 20.3	128 46.8	58.3	34 57.5	55.1	234 09.6	24.8	134 31.4	53.2	205 39.6	142	7 32.7	−126
	21	11 22.8	143 50.6	·· 57.3	49 58.3	·· 54.5	249 12.1	·· 24.8	149 33.6	·· 53.3	220 12.8	142	· 7 20.1	−127
	22	26 25.3	158 54.4	56.3	64 59.1	53.9	264 14.5	24.9	164 35.7	53.4	234 46.0	142	7 07.4	−126
	23	41 27.7	173 58.3	55.3	79 59.8	53.3	279 17.0	24.9	179 37.9	53.5	249 19.2	143	6 54.8	−127
	24	56 30.2	189 02.1	−20 54.3	95 00.6	−16 52.7	294 19.5	+20 24.9	194 40.1	−13 53.5	263 52.5	144	+ 6 42.1	−127
code		—	+ 38	+ 10	+ 7	+ 6	+ 24	0	+ 21	− 1				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
15 0	183 52.6	−18 17.6
1	198 52.5	18.3
2	213 52.4	18.9
3	228 52.3	19.6
4	243 52.2	20.2
5	258 52.1	20.9
6	273 52.0	−18 21.5
7	288 51.9	22.2
8	303 51.8	22.8
9	318 51.7	23.5
10	333 51.6	24.1
11	348 51.5	24.7
12	3 51.4	−18 25.4
13	18 51.3	26.0
14	33 51.2	26.7
15	48 51.1	27.3
16	63 51.0	28.0
17	78 50.8	28.6
18	93 50.7	−18 29.2
19	108 50.6	29.9
20	123 50.5	30.5
21	138 50.4	31.1
22	153 50.3	31.8
23	168 50.2	32.4
16 0	183 50.1	−18 33.0
1	198 50.0	33.7
2	213 49.9	34.3
3	228 49.8	35.0
4	243 49.7	35.6
5	258 49.6	36.2
6	273 49.5	−18 36.8
7	288 49.3	37.5
8	303 49.2	38.1
9	318 49.1	38.7
10	333 49.0	39.4
11	348 48.9	40.0
12	3 48.8	−18 40.6
13	18 48.7	41.3
14	33 48.6	41.9
15	48 48.5	42.5
16	63 48.3	43.1
17	78 48.2	43.8
18	93 48.1	−18 44.4
19	108 48.0	45.0
20	123 47.9	45.6
21	138 47.8	46.3
22	153 47.7	46.9
23	168 47.5	47.5
17 0	183 47.4	−18 48.1
1	198 47.3	48.7
2	213 47.2	49.4
3	228 47.1	50.0
4	243 47.0	50.6
5	258 46.8	51.2
6	273 46.7	−18 51.8
7	288 46.6	52.5
8	303 46.5	53.1
9	318 46.4	53.7
10	333 46.2	54.3
11	348 46.1	54.9
12	3 46.0	−18 55.5
13	18 45.9	56.1
14	33 45.8	56.8
15	48 45.6	57.4
16	63 45.5	58.0
17	78 45.4	58.6
18	93 45.3	−18 59.2
19	108 45.1	18 59.8
20	123 45.0	19 00.4
21	138 44.9	01.0
22	153 44.8	01.6
23	168 44.6	02.3
24	183 44.5	−19 02.9
code	—	− 7

STARS

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.1	−40 29.0
5	Achernar	335 58.7	−57 27.9
30	Acrux	173 59.1	−62 50.8
19	Adhara	255 46.8	−28 54.4
10	Aldebaran	291 39.5	+16 25.3
32	Alioth	166 59.5	+56 12.0
34	Alkaid	153 33.8	+49 32.1
55	Al Na'ir	28 38.7	−47 10.9
15	Alnilam	276 30.6	− 1 13.6
25	Alphard	218 39.2	− 8 27.7
41	Alphecca	126 48.5	+26 51.9
1	Alpheratz	358 28.8	+28 50.8
51	Altair	62 51.2	+ 8 45.0
2	Ankaa	353 58.6	−42 33.1
42	Antares	113 20.5	−26 20.0
37	Arcturus	146 36.1	+19 24.9
43	Atria	109 02.4	−68 57.0
22	Avior	234 35.9	−59 21.6
13	Bellatrix	279 18.8	+ 6 18.7
16	Betelg'se	271 48.6	+ 7 24.1
17	Canopus	264 15.2	−52 40.0
12	Capella	281 38.9	+45 57.3
53	Deneb	50 01.6	+45 07.4
28	Denebola	183 18.6	+14 49.4
4	Diphda	349 39.6	−18 13.9
27	Dubhe	194 45.5	+61 59.4
14	Elnath	279 07.8	+28 34.3
47	Eltanin	91 07.0	+51 29.8
54	Enif	34 30.2	+ 9 40.2
56	Fomalhaut	16 12.2	−29 51.7
31	Gacrux	172 50.4	−56 51.5
29	Gienah	176 37.8	−17 17.4
35	Hadar	149 51.0	−60 09.3
6	Hamal	328 50.1	+23 15.2
48	Kaus Aust.	84 42.3	−34 24.5
40	Kochab	137 19.0	+74 20.3
57	Markab	14 22.0	+14 58.0
8	Menkar	315 00.7	+ 3 55.0
36	Menkent	148 59.8	−36 08.9
24	Miapl'dus	221 49.1	−69 31.6
9	Mirfak	309 42.8	+49 42.3
50	Nunki	76 52.9	−26 21.3
52	Peacock	54 28.5	−56 53.1
21	Pollux	244 21.2	+28 08.1
20	Procyon	245 45.5	+ 5 20.5
46	R'alhague	96 47.5	+12 35.6
26	Regulus	208 30.2	+12 11.2
11	Rigel	281 53.9	− 8 15.0
38	Rigil Kent.	140 52.6	−60 39.0
44	Sabik	103 03.2	−15 40.2
3	Schedar	350 30.4	+56 17.8
45	Shaula	97 21.9	−37 04.4
18	Sirius	259 12.2	−16 39.0
33	Spica	159 17.9	−10 55.6
23	Suhail	223 24.8	−43 14.7
49	Vega	81 09.0	+38 44.6
39	Zub'g'bi	137 54.4	−15 51.3

Lat.	Sunrise	Twlt. begins	Moonrise 15	Moonrise 16	Moonrise 17	Moonrise 18
N °	h m	h m	h m	h m	h m	h m
72	11 16	5 37	17 53	20 48	22 56	24 52
70	9 53	5 35	18 54	21 11	23 07	24 54
68	9 16	5 34	19 29	21 28	23 15	24 55
66	8 49	5 32	19 54	21 42	23 22	24 56
64	8 29	5 31	20 13	21 54	23 28	24 58
62	8 13	5 29	20 28	22 03	23 33	24 58
60	7 59	5 28	20 42	22 12	23 37	24 59
58	7 48	5 25	20 53	22 19	23 41	25 00
56	7 38	5 24	21 02	22 25	23 44	25 01
54	7 29	5 23	21 11	22 31	23 48	25 01
52	7 21	5 21	21 18	22 36	23 50	25 02
50	7 14	5 19	21 25	22 41	23 53	25 02
45	6 58	5 15	21 40	22 51	23 58	25 03
40	6 46	5 11	21 52	22 59	24 03	0 03
35	6 35	5 07	22 02	23 06	24 07	0 07
30	6 26	5 02	22 11	23 12	24 10	0 10
20	6 09	4 53	22 26	23 23	24 16	0 16
10	5 55	4 41	22 39	23 32	24 21	0 21
0	5 41	4 28	22 52	23 40	24 26	0 26
10	5 27	4 12	23 04	23 49	24 31	0 31
20	5 13	3 53	23 17	23 58	24 36	0 36
30	4 56	3 26	23 32	24 09	0 09	0 42
35	4 46	3 08	23 41	24 15	0 15	0 45
40	4 34	2 45	23 51	24 22	0 22	0 49
45	4 21	2 14	24 02	0 02	0 29	0 53
50	4 05	1 27	24 16	0 16	0 39	0 58
52	3 56	0 50	24 22	0 22	0 43	1 01
54	3 47	////	0 05	0 29	0 48	1 03
56	3 37	////	0 15	0 37	0 53	1 06
58	3 26	////	0 28	0 46	0 59	1 09
60	3 13	////	0 42	0 56	1 06	1 13
S						

Lat.	Sunset	Twlt. ends	Moonset 15	Moonset 16	Moonset 17	Moonset 18
N °	h m	h m	h m	h m	h m	h m
72	12 12	17 47	15 43	14 31	13 58	13 34
70	13 35	17 49	14 40	14 06	13 46	13 29
68	14 13	17 52	14 04	13 47	13 35	13 25
66	14 39	17 53	13 38	13 32	13 27	13 22
64	15 00	17 56	13 17	13 19	13 19	13 19
62	15 16	17 58	13 01	13 09	13 13	13 16
60	15 29	17 59	12 47	12 59	13 07	13 14
58	15 41	18 01	12 35	12 51	13 03	13 12
56	15 51	18 03	12 25	12 44	12 58	13 10
54	16 00	18 05	12 16	12 37	12 54	13 08
52	16 08	18 07	12 08	12 32	12 51	13 07
50	16 15	18 08	12 00	12 26	12 47	13 06
45	16 31	18 13	11 44	12 15	12 40	13 03
40	16 43	18 17	11 31	12 05	12 34	13 00
35	16 54	18 22	11 20	11 57	12 29	12 58
30	17 04	18 27	11 10	11 50	12 24	12 56
20	17 20	18 36	10 53	11 37	12 16	12 52
10	17 35	18 48	10 38	11 26	12 09	12 49
0	17 48	19 01	10 24	11 16	12 03	12 46
10	18 02	19 17	10 10	11 05	11 56	12 44
20	18 17	19 37	9 55	10 54	11 48	12 40
30	18 34	20 05	9 38	10 40	11 40	12 37
35	18 44	20 23	9 27	10 33	11 35	12 35
40	18 56	20 46	9 16	10 24	11 30	12 32
45	19 09	21 17	9 02	10 14	11 23	12 30
50	19 25	22 05	8 45	10 01	11 15	12 26
52	19 34	22 45	8 36	9 56	11 12	12 25
54	19 43	////	8 27	9 49	11 08	12 23
56	19 53	////	8 17	9 42	11 03	12 21
58	20 05	////	8 05	9 34	10 58	12 19
60	20 18	////	7 52	9 25	10 53	12 17
S						

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.5	0.5	0.1
30			
	0.5	0.4	0.1
45			
	0.5	0.3	0.1
60			
	0.5	0.2	0.1
75			
	0.5	0.1	0.0
90			

Moon's Lower Limb
Add

Alt.	15	16	17
°	′	′	′
0			
	17.2	15.9	14.8
4			
	17.2	15.9	14.8
8			
	17.2	15.9	14.8
12			
	17.2	15.9	14.8
16			
	17.1	15.9	14.8
20			
	17.1	15.9	14.8
24			
	17.1	15.9	14.8
28			
	17.0	15.9	14.9
32			
	17.0	15.9	14.9
36			
	16.9	15.9	14.9
40			
	16.9	15.9	14.9
44			
	16.8	15.8	15.0
48			
	16.7	15.8	15.0
52			
	16.7	15.8	15.0
56			
	16.6	15.8	15.1
60			
	16.5	15.8	15.1
64			
	16.4	15.8	15.1
68			
	16.4	15.7	15.2
72			
	16.3	15.7	15.2
76			
	16.2	15.7	15.3
80			
	16.1	15.7	15.3
84			
	16.0	15.7	15.3
88			
	15.9	15.6	15.4
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	15	16	17
°	′	′	′
0			
	14.6	15.3	16.0
4			
	14.6	15.3	16.0
8			
	14.6	15.3	16.0
12			
	14.6	15.3	16.0
16			
	14.7	15.3	16.0
20			
	14.7	15.4	15.9
24			
	14.7	15.4	15.9
28			
	14.8	15.4	15.9
32			
	14.8	15.4	15.9
36			
	14.9	15.4	15.9
40			
	14.9	15.4	15.8
44			
	15.0	15.4	15.8
48			
	15.1	15.4	15.8
52			
	15.1	15.5	15.7
56			
	15.2	15.5	15.7
60			
	15.3	15.5	15.7
64			
	15.4	15.5	15.6
68			
	15.5	15.5	15.6
72			
	15.5	15.5	15.6
76			
	15.6	15.6	15.5
80			
	15.7	15.6	15.5
84			
	15.8	15.6	15.4
88			
	15.9	15.6	15.4
90			

Subtract from table, back cover

Equation of Time (App.—Mean)

GMT	15	16	17
h	m s	m s	m s
0	+15 30.5	+15 20.6	+15 09.9
6	+15 28.1	+15 18.0	+15 07.1
12	+15 25.7	+15 15.4	+15 04.2
18	+15 23.2	+15 12.7	+15 01.3
24	+15 20.6	+15 09.9	+14 58.3

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
15	4 11	11 39	17 43	4 34	11 10
16	5 04	11 33	17 42	4 30	11 07
17	5 52	11 27	17 40	4 26	11 03
18	6 36	11 21	17 39	4 22	11 00

Last Quarter 17

GMT	♈ GHA	VENUS −3.2 GHA	VENUS Dec.	MARS 0.3 GHA	MARS Dec.	JUPITER −2.0 GHA	JUPITER Dec.	SATURN 0.8 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
18 0	56 30.2	189 02.1	−20 54.3	95 00.6	−16 52.7	294 19.5	+20 24.9	194 40.1	−13 53.5	263 52.5	144	+ 6 42.1	−127
1	71 32.7	204 05.9	53.3	110 01.3	52.1	309 21.9	24.9	209 42.2	53.6	278 25.9	144	6 29.4	−127
2	86 35.1	219 09.7	52.3	125 02.1	51.5	324 24.4	24.9	224 44.4	53.7	292 59.3	145	6 16.7	−127
3	101 37.6	234 13.5	51.3	140 02.9	50.9	339 26.9	24.9	239 46.6	53.8	307 32.8	145	6 04.0	−127
4	116 40.0	249 17.3	50.3	155 03.6	50.3	354 29.3	24.9	254 48.8	53.9	322 06.3	146	5 51.3	−127
5	131 42.5	264 21.1	49.3	170 04.4	49.6	9 31.8	24.9	269 50.9	54.0	336 39.9	147	5 38.6	−128
6	146 45.0	279 24.9	−20 48.3	185 05.1	−16 49.0	24 34.3	+20 24.9	284 53.1	−13 54.1	351 13.6	146	+ 5 25.8	−127
7	161 47.4	294 28.7	47.3	200 05.9	48.4	39 36.8	24.9	299 55.3	54.2	5 47.2	148	5 13.1	−128
8	176 49.9	309 32.5	46.3	215 06.7	47.8	54 39.2	24.9	314 57.4	54.2	20 21.0	148	5 00.3	−127
9	191 52.4	324 36.3	45.3	230 07.4	47.2	69 41.7	24.9	329 59.6	54.3	34 54.8	148	4 47.6	−128
10	206 54.8	339 40.1	44.3	245 08.2	46.6	84 44.2	25.0	345 01.8	54.4	49 28.6	149	4 34.8	−128
11	221 57.3	354 43.9	43.3	260 09.0	46.0	99 46.7	25.0	0 04.0	54.5	64 02.5	149	4 22.0	−128
12	236 59.8	9 47.7	−20 42.3	275 09.7	−16 45.4	114 49.1	+20 25.0	15 06.1	−13 54.6	78 36.4	150	+ 4 09.2	−128
13	252 02.2	24 51.5	41.3	290 10.5	44.8	129 51.6	25.0	30 08.3	54.7	93 10.4	150	3 56.4	−128
14	267 04.7	39 55.3	40.3	305 11.2	44.2	144 54.1	25.0	45 10.5	54.8	107 44.4	150	3 43.6	−127
15	282 07.2	54 59.1	39.3	320 12.0	43.6	159 56.6	25.0	60 12.7	54.8	122 18.4	151	3 30.9	−128
16	297 09.6	70 02.9	38.3	335 12.8	43.0	174 59.0	25.0	75 14.8	54.9	136 52.5	151	3 18.1	−128
17	312 12.1	85 06.7	37.3	350 13.5	42.3	190 01.5	25.0	90 17.0	55.0	151 26.6	152	3 05.3	−128
18	327 14.5	100 10.4	−20 36.3	5 14.3	−16 41.7	205 04.0	+20 25.0	105 19.2	−13 55.1	166 00.8	152	+ 2 52.5	−128
19	342 17.0	115 14.2	35.3	20 15.1	41.1	220 06.5	25.0	120 21.3	55.2	180 35.0	153	2 39.7	−128
20	357 19.5	130 18.0	34.3	35 15.8	40.5	235 08.9	25.0	135 23.5	55.3	195 09.3	152	2 26.9	−128
21	12 21.9	145 21.8	33.2	50 16.6	39.9	250 11.4	25.1	150 25.7	55.4	209 43.5	154	2 14.1	−128
22	27 24.4	160 25.6	32.2	65 17.3	39.3	265 13.9	25.1	165 27.9	55.5	224 17.9	153	2 01.3	−128
23	42 26.9	175 29.3	31.2	80 18.1	38.7	280 16.4	25.1	180 30.0	55.5	238 52.2	154	1 48.5	−128
19 0	57 29.3	190 33.1	−20 30.2	95 18.9	−16 38.1	295 18.8	+20 25.1	195 32.2	−13 55.6	253 26.6	154	+ 1 35.7	−128
1	72 31.8	205 36.9	29.2	110 19.6	37.4	310 21.3	25.1	210 34.4	55.7	268 01.0	154	1 22.9	−128
2	87 34.3	220 40.7	28.2	125 20.4	36.8	325 23.8	25.1	225 36.6	55.8	282 35.4	155	1 10.1	−127
3	102 36.7	235 44.4	27.2	140 21.2	36.2	340 26.3	25.1	240 38.7	55.9	297 09.9	155	0 57.4	−128
4	117 39.2	250 48.2	26.2	155 21.9	35.6	355 28.8	25.1	255 40.9	56.0	311 44.4	155	0 44.6	−127
5	132 41.7	265 51.9	25.2	170 22.7	35.0	10 31.2	25.1	270 43.1	56.1	326 18.9	155	0 31.9	−128
6	147 44.1	280 55.7	−20 24.2	185 23.4	−16 34.4	25 33.7	+20 25.2	285 45.2	−13 56.2	340 53.4	156	+ 0 19.1	−127
7	162 46.6	295 59.5	23.2	200 24.2	33.8	40 36.2	25.2	300 47.4	56.2	355 28.0	156	+ 0 06.4	−127
8	177 49.0	311 03.2	22.2	215 25.0	33.2	55 38.7	25.2	315 49.6	56.3	10 02.6	156	− 0 06.3	−128
9	192 51.5	326 07.0	21.2	230 25.7	32.5	70 41.2	25.2	330 51.8	56.4	24 37.2	156	0 19.1	−127
10	207 54.0	341 10.7	20.2	245 26.5	31.9	85 43.7	25.2	345 53.9	56.5	39 11.8	156	0 31.8	−126
11	222 56.4	356 14.5	19.2	260 27.3	31.3	100 46.1	25.2	0 56.1	56.6	53 46.4	157	0 44.4	−127
12	237 58.9	11 18.2	−20 18.2	275 28.0	−16 30.7	115 48.6	+20 25.2	15 58.3	−13 56.7	68 21.1	157	− 0 57.1	−127
13	253 01.4	26 22.0	17.2	290 28.8	30.1	130 51.1	25.2	31 00.5	56.8	82 55.8	157	1 09.8	−126
14	268 03.8	41 25.7	16.2	305 29.6	29.5	145 53.6	25.2	46 02.6	56.8	97 30.5	157	1 22.4	−127
15	283 06.3	56 29.4	15.2	320 30.3	28.9	160 56.1	25.3	61 04.8	56.9	112 05.2	157	1 35.1	−126
16	298 08.8	71 33.2	14.2	335 31.1	28.2	175 58.6	25.3	76 07.0	57.0	126 39.9	158	1 47.7	−128
17	313 11.2	86 36.9	13.2	350 31.8	27.6	191 01.0	25.3	91 09.2	57.1	141 14.7	157	2 00.3	−126
18	328 13.7	101 40.7	−20 12.1	5 32.6	−16 27.0	206 03.5	+20 25.3	106 11.3	−13 57.2	155 49.4	158	− 2 12.9	−126
19	343 16.1	116 44.4	11.1	20 33.4	26.4	221 06.0	25.3	121 13.5	57.3	170 24.2	158	2 25.5	−125
20	358 18.6	131 48.1	10.1	35 34.1	25.8	236 08.5	25.3	136 15.7	57.4	184 59.0	158	2 38.0	−125
21	13 21.1	146 51.8	09.1	50 34.9	25.2	251 11.0	25.3	151 17.8	57.4	199 33.8	158	2 50.5	−126
22	28 23.5	161 55.6	08.1	65 35.7	24.5	266 13.5	25.3	166 20.0	57.5	214 08.6	158	3 03.1	−125
23	43 26.0	176 59.3	07.1	80 36.4	23.9	281 16.0	25.3	181 22.2	57.6	228 43.4	158	3 15.6	−124
20 0	58 28.5	192 03.0	−20 06.1	95 37.2	−16 23.3	296 18.4	+20 25.4	196 24.4	−13 57.7	243 18.2	158	− 3 28.0	−125
1	73 30.9	207 06.7	05.1	110 38.0	22.7	311 20.9	25.4	211 26.5	57.8	257 53.0	158	3 40.5	−124
2	88 33.4	222 10.5	04.1	125 38.7	22.1	326 23.4	25.4	226 28.7	57.9	272 27.8	159	3 52.9	−124
3	103 35.9	237 14.2	03.1	140 39.5	21.4	341 25.9	25.4	241 30.9	58.0	287 02.7	158	4 05.3	−124
4	118 38.3	252 17.9	02.1	155 40.2	20.8	356 28.4	25.4	256 33.1	58.1	301 37.5	158	4 17.7	−123
5	133 40.8	267 21.6	01.1	170 41.0	20.2	11 30.9	25.4	271 35.2	58.1	316 12.3	158	4 30.0	−124
6	148 43.3	282 25.3	−20 00.1	185 41.8	−16 19.6	26 33.4	+20 25.4	286 37.4	−13 58.2	330 47.1	159	− 4 42.4	−123
7	163 45.7	297 29.0	19 59.1	200 42.5	19.0	41 35.9	25.4	301 39.6	58.3	345 22.0	158	4 54.7	−123
8	178 48.2	312 32.7	58.1	215 43.3	18.4	56 38.4	25.5	316 41.8	58.4	359 56.8	158	5 07.0	−122
9	193 50.6	327 36.4	57.1	230 44.1	17.7	71 40.8	25.5	331 43.9	58.5	14 31.6	159	5 19.2	−122
10	208 53.1	342 40.1	56.1	245 44.8	17.1	86 43.3	25.5	346 46.1	58.6	29 06.5	158	5 31.4	−122
11	223 55.6	357 43.8	55.1	260 45.6	16.5	101 45.8	25.5	1 48.3	58.7	43 41.3	158	5 43.6	−122
12	238 58.0	12 47.5	−19 54.1	275 46.4	−16 15.9	116 48.3	+20 25.5	16 50.4	−13 58.7	58 16.1	158	− 5 55.8	−122
13	254 00.5	27 51.2	53.1	290 47.1	15.3	131 50.8	25.5	31 52.6	58.8	72 50.9	158	6 08.0	−121
14	269 03.0	42 54.9	52.1	305 47.9	14.6	146 53.3	25.5	46 54.8	58.9	87 25.7	158	6 20.1	−120
15	284 05.4	57 58.5	51.1	320 48.6	14.0	161 55.8	25.5	61 57.0	59.0	102 00.5	158	6 32.1	−121
16	299 07.9	73 02.2	50.1	335 49.4	13.4	176 58.3	25.6	76 59.1	59.1	116 35.3	158	6 44.2	−120
17	314 10.4	88 05.9	49.1	350 50.2	12.8	192 00.8	25.6	92 01.3	59.2	131 10.1	157	6 56.2	−120
18	329 12.8	103 09.6	−19 48.1	5 50.9	−16 12.1	207 03.3	+20 25.6	107 03.5	−13 59.3	145 44.8	158	− 7 08.2	−119
19	344 15.3	118 13.3	47.1	20 51.7	11.5	222 05.8	25.6	122 05.7	59.3	160 19.6	157	7 20.1	−120
20	359 17.7	133 16.9	46.1	35 52.5	10.9	237 08.3	25.6	137 07.8	59.4	174 54.3	158	7 32.1	−118
21	14 20.2	148 20.6	45.1	50 53.2	10.3	252 10.8	25.6	152 10.0	59.5	189 29.1	157	7 43.9	−119
22	29 22.7	163 24.3	44.1	65 54.0	09.7	267 13.3	25.6	167 12.2	59.6	204 03.8	157	7 55.8	−118
23	44 25.1	178 27.9	43.1	80 54.8	09.0	282 15.7	25.6	182 14.4	59.7	218 38.5	157	8 07.6	−118
24	59 27.6	193 31.6	−19 42.1	95 55.5	−16 08.4	297 18.2	+20 25.7	197 16.5	−13 59.8	233 13.2	156	− 8 19.4	−117
code	—	+ 38	+ 10	+ 8	+ 6	+ 25	0	+ 22	− 1				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
18 0	183 44.5	−19 02.9
1	198 44.4	03.5
2	213 44.3	04.1
3	228 44.1 ••	04.7
4	243 44.0	05.3
5	258 43.9	05.9
6	273 43.8	−19 06.5
7	288 43.6	07.1
8	303 43.5	07.7
9	318 43.4 ••	08.3
10	333 43.3	08.9
11	348 43.1	09.5
12	3 43.0	−19 10.1
13	18 42.9	10.7
14	33 42.7	11.3
15	48 42.6 ••	11.9
16	63 42.5	12.5
17	78 42.3	13.1
18	93 42.2	−19 13.7
19	108 42.1	14.3
20	123 41.9	14.9
21	138 41.8 ••	15.5
22	153 41.7	16.1
23	168 41.5	16.7
19 0	183 41.4	−19 17.3
1	198 41.3	17.9
2	213 41.1	18.4
3	228 41.0 ••	19.0
4	243 40.9	19.6
5	258 40.7	20.2
6	273 40.6	−19 20.8
7	288 40.5	21.4
8	303 40.3	22.0
9	318 40.2 ••	22.6
10	333 40.1	23.2
11	348 39.9	23.8
12	3 39.8	−19 24.3
13	18 39.6	24.9
14	33 39.5	25.5
15	48 39.4 ••	26.1
16	63 39.2	26.7
17	78 39.1	27.3
18	93 38.9	−19 27.8
19	108 38.8	28.4
20	123 38.7	29.0
21	138 38.5 ••	29.6
22	153 38.4	30.2
23	168 38.2	30.7
20 0	183 38.1	−19 31.3
1	198 37.9	31.9
2	213 37.8	32.5
3	228 37.7 ••	33.1
4	243 37.5	33.6
5	258 37.4	34.2
6	273 37.2	−19 34.8
7	288 37.1	35.4
8	303 36.9	35.9
9	318 36.8 ••	36.5
10	333 36.6	37.1
11	348 36.5	37.6
12	3 36.3	−19 38.2
13	18 36.2	38.8
14	33 36.1	39.4
15	48 35.9 ••	39.9
16	63 35.8	40.5
17	78 35.6	41.1
18	93 35.5	−19 41.6
19	108 35.3	42.2
20	123 35.2	42.8
21	138 35.0 ••	43.3
22	153 34.9	43.9
23	168 34.7	44.5
24	183 34.6	−19 45.0
code	–	– 6

STARS No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.1	−40 29.0
5	Achernar	335 58.7	−57 27.9
30	Acrux	173 59.1	−62 50.8
19	Adhara	255 46.8	−28 54.4
10	Aldebaran	291 39.5	+16 25.3
32	Alioth	166 59.4	+56 12.0
34	Alkaid	153 33.8	+49 32.1
55	Al Na'ir	28 38.7	−47 10.9
15	Alnilam	276 30.6	− 1 13.6
25	Alphard	218 39.2	− 8 27.7
41	Alphecca	126 48.5	+26 51.9
1	Alpheratz	358 28.8	+28 50.8
51	Altair	62 51.2	+ 8 45.0
2	Ankaa	353 58.6	−42 33.1
42	Antares	113 20.5	−26 20.0
37	Arcturus	146 36.1	+19 24.9
43	Atria	109 02.4	−68 57.0
22	Avior	234 35.8	−59 21.6
13	Bellatrix	279 18.8	+ 6 18.7
16	Betelg'se	271 48.5	+ 7 24.1
17	Canopus	264 15.2	−52 40.0
12	Capella	281 38.9	+45 57.3
53	Deneb	50 01.6	+45 07.4
28	Denebola	183 18.5	+14 49.4
4	Diphda	349 39.6	−18 13.9
27	Dubhe	194 45.5	+61 59.4
14	Elnath	279 07.8	+28 34.3
47	Eltanin	91 07.0	+51 29.8
54	Enif	34 30.3	+ 9 40.2
56	Fomalhaut	16 12.2	−29 51.7
31	Gacrux	172 50.4	−56 51.5
29	Gienah	176 37.7	−17 17.4
35	Hadar	149 51.0	−60 09.3
6	Hamal	328 50.1	+23 15.2
48	Kaus Aust.	84 42.4	−34 24.5
40	Kochab	137 19.0	+74 20.2
57	Markab	14 22.0	+14 58.0
8	Menkar	315 00.7	+ 3 55.0
36	Menkent	148 59.8	−36 08.9
24	Miapl'dus	221 49.1	−69 31.6
9	Mirfak	309 42.8	+49 42.3
50	Nunki	76 53.0	−26 21.3
52	Peacock	54 28.5	−56 53.1
21	Pollux	244 21.1	+28 08.1
20	Procyon	245 45.5	+ 5 20.5
46	R'alhague	96 47.5	+12 35.6
26	Regulus	208 30.2	+12 11.2
11	Rigel	281 53.9	− 8 15.0
38	Rigil Kent.	140 52.6	−60 39.0
44	Sabik	103 03.2	−15 40.2
3	Schedar	350 30.4	+56 17.8
45	Shaula	97 21.9	−37 04.4
18	Sirius	259 12.2	−16 39.0
33	Spica	159 17.8	−10 55.6
23	Suhail	223 24.7	−43 14.8
49	Vega	81 09.0	+38 44.6
39	Zub'g'bi	137 54.4	−15 51.3

Lat.	Sunrise	Twlt. begins	Moonrise 18	19	20	21
°	h m	h m	h m	h m	h m	h m
N 72	■	5 48	24 52	0 52	2 43	4 36
70	10 15	5 44	24 54	0 54	2 37	4 21
68	9 30	5 42	24 55	0 55	2 32	4 09
66	9 01	5 40	24 56	0 56	2 28	3 59
64	8 39	5 38	24 58	0 58	2 24	3 51
62	8 21	5 36	24 58	0 58	2 21	3 44
60	8 07	5 33	24 59	0 59	2 19	3 38
58	7 54	5 31	25 00	1 00	2 17	3 33
56	7 44	5 29	25 01	1 01	2 15	3 28
54	7 34	5 28	25 01	1 01	2 13	3 24
52	7 26	5 25	25 02	1 02	2 11	3 20
50	7 19	5 23	25 02	1 02	2 10	3 17
45	7 02	5 19	25 03	1 03	2 07	3 09
40	6 49	5 14	0 03	1 04	2 04	3 03
35	6 38	5 09	0 07	1 05	2 02	2 58
30	6 28	5 04	0 10	1 05	2 00	2 53
20	6 11	4 53	0 16	1 07	1 56	2 45
10	5 56	4 43	0 21	1 08	1 53	2 38
0	5 42	4 29	0 26	1 09	1 50	2 32
10	5 27	4 12	0 31	1 10	1 48	2 25
20	5 12	3 51	0 36	1 11	1 45	2 19
30	4 54	3 24	0 42	1 12	1 41	2 11
35	4 44	3 05	0 45	1 13	1 39	2 07
40	4 32	2 42	0 49	1 13	1 37	2 01
45	4 18	2 09	0 53	1 14	1 35	1 56
50	4 00	1 14	0 58	1 15	1 32	1 49
52	3 52	0 32	1 01	1 16	1 31	1 46
54	3 43	////	1 03	1 16	1 29	1 42
56	3 32	////	1 06	1 17	1 28	1 39
58	3 21	////	1 09	1 18	1 26	1 34
S 60	3 07	////	1 13	1 19	1 24	1 30

Lat.	Sunset	Twlt. ends	Moonset 18	19	20	21
°	h m	h m	h m	h m	h m	h m
N 72	■	17 38	13 34	13 12	12 50	12 24
70	13 15	17 42	13 29	13 14	12 59	12 42
68	14 00	17 45	13 25	13 16	13 06	12 55
66	14 29	17 48	13 22	13 17	13 12	13 07
64	14 51	17 50	13 19	13 18	13 17	13 16
62	15 09	17 53	13 16	13 19	13 21	13 24
60	15 23	17 55	13 14	13 20	13 25	13 31
58	15 36	17 58	13 12	13 20	13 28	13 38
56	15 46	17 59	13 10	13 21	13 32	13 43
54	15 56	18 02	13 08	13 21	13 34	13 48
52	16 04	18 04	13 07	13 22	13 37	13 53
50	16 12	18 06	13 06	13 22	13 39	13 57
45	16 28	18 11	13 03	13 23	13 44	14 06
40	16 41	18 15	13 00	13 24	13 48	14 13
35	16 53	18 21	12 58	13 25	13 52	14 20
30	17 02	18 25	12 56	13 26	13 55	14 25
20	17 20	18 37	12 52	13 27	14 01	14 35
10	17 35	18 48	12 49	13 28	14 06	14 44
0	17 49	19 02	12 46	13 29	14 10	14 52
10	18 03	19 18	12 44	13 30	14 15	15 00
20	18 19	19 40	12 40	13 31	14 20	15 09
30	18 37	20 08	12 37	13 32	14 26	15 19
35	18 47	20 27	12 35	13 32	14 29	15 25
40	18 59	20 51	12 32	13 33	14 33	15 32
45	19 13	21 24	12 30	13 34	14 37	15 39
50	19 31	22 20	12 26	13 35	14 42	15 49
52	19 39	23 06	12 25	13 35	14 44	15 53
54	19 49	////	12 23	13 36	14 47	15 58
56	19 59	////	12 21	13 36	14 50	16 03
58	20 11	////	12 19	13 37	14 53	16 09
S 60	20 26	////	12 17	13 37	14 57	16 16

GMT	Equation of Time (App.—Mean) 18	19	20
h	m s	m s	m s
0	+14 58.3	+14 45.9	+14 32.6
6	+14 55.3	+14 42.7	+14 29.2
12	+14 52.2	+14 39.4	+14 25.7
18	+14 49.1	+14 36.0	+14 22.1
24	+14 45.9	+14 32.6	+14 18.5

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
18	6 36	11 21	17 39	4 22	11 00
19	7 19	11 15	17 38	4 18	10 56
20	8 00	11 09	17 37	4 14	10 53
21	8 42	11 03	17 35	4 10	10 49

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.5	0.5	0.1
30			
	0.5	0.4	0.1
45			
	0.5	0.3	0.1
60			
	0.5	0.2	0.1
75			
	0.5	0.1	0.0
90			

Moon's Lower Limb **Add**

Alt.	18	19	20
°	′	′	′
0			
	13.9	13.1	12.5
4			
	13.9	13.1	12.5
8			
	13.9	13.2	12.5
12			
	13.9	13.2	12.6
16			
	14.0	13.2	12.6
20			
	14.0	13.3	12.7
24			
	14.0	13.3	12.7
28			
	14.1	13.4	12.8
32			
	14.1	13.5	12.9
36			
	14.2	13.5	13.0
40			
	14.2	13.6	13.1
44			
	14.3	13.7	13.2
48			
	14.4	13.8	13.4
52			
	14.4	13.9	13.5
56			
	14.5	14.0	13.6
60			
	14.6	14.1	13.8
64			
	14.7	14.3	13.9
68			
	14.8	14.4	14.1
72			
	14.8	14.5	14.2
76			
	14.9	14.6	14.4
80			
	15.0	14.8	14.6
84			
	15.1	14.9	14.7
88			
	15.2	15.0	14.9
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	18	19	20
°	′	′	′
0			
	16.5	16.9	17.3
4			
	16.5	16.9	17.3
8			
	16.5	16.9	17.3
12			
	16.5	16.9	17.2
16			
	16.4	16.8	17.2
20			
	16.4	16.8	17.1
24			
	16.4	16.7	17.1
28			
	16.3	16.7	17.0
32			
	16.3	16.6	16.9
36			
	16.2	16.5	16.8
40			
	16.2	16.4	16.7
44			
	16.1	16.4	16.6
48			
	16.0	16.3	16.4
52			
	16.0	16.2	16.3
56			
	15.9	16.0	16.2
60			
	15.8	15.9	16.0
64			
	15.7	15.8	15.9
68			
	15.6	15.7	15.7
72			
	15.6	15.6	15.6
76			
	15.5	15.4	15.4
80			
	15.4	15.3	15.2
84			
	15.3	15.2	15.1
88			
	15.2	15.1	14.9
90			

Subtract from table, back cover

992941°—53——13

GMT		♈ GHA	VENUS −3.4 GHA	VENUS Dec.	MARS 0.4 GHA	MARS Dec.	JUPITER −2.0 GHA	JUPITER Dec.	SATURN 0.8 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
21	0	59 27.6	193 31.6	−19 42.1	95 55.5	−16 08.4	297 18.2	+20 25.7	197 16.5	−13 59.8	233 13.2	156	− 8 19.4	−117
	1	74 30.1	208 35.3	41.1	110 56.3	07.8	312 20.7	25.7	212 18.7	59.9	247 47.8	157	8 31.1	−117
	2	89 32.5	223 38.9	40.1	125 57.1	07.2	327 23.2	25.7	227 20.9	13 59.9	262 22.5	156	8 42.8	−117
	3	104 35.0	238 42.6	·· 39.1	140 57.8	·· 06.5	342 25.7	·· 25.7	242 23.1	·14 00.0	276 57.1	157	· 8 54.5	−116
	4	119 37.5	253 46.2	38.1	155 58.6	05.9	357 28.2	25.7	257 25.2	00.1	291 31.8	156	9 06.1	−116
	5	134 39.9	268 49.9	37.1	170 59.4	05.3	12 30.7	25.7	272 27.4	00.2	306 06.4	155	9 17.7	−115
	6	149 42.4	283 53.5	−19 36.1	186 00.1	−16 04.7	27 33.2	+20 25.7	287 29.6	−14 00.3	320 40.9	156	− 9 29.2	−115
	7	164 44.9	298 57.1	35.1	201 00.9	04.0	42 35.7	25.8	302 31.8	00.4	335 15.5	155	9 40.7	−114
	8	179 47.3	314 00.8	34.1	216 01.7	03.4	57 38.2	25.8	317 33.9	00.5	349 50.0	155	9 52.1	−115
	9	194 49.8	329 04.4	·· 33.1	231 02.4	·· 02.8	72 40.7	·· 25.8	332 36.1	·· 00.5	4 24.5	155	·10 03.6	−113
	10	209 52.2	344 08.1	32.1	246 03.2	02.2	87 43.2	25.8	347 38.3	00.6	18 59.0	155	10 14.9	−114
	11	224 54.7	359 11.7	31.2	261 03.9	01.5	102 45.7	25.8	2 40.4	00.7	33 33.5	154	10 26.3	−112
	12	239 57.2	14 15.3	−19 30.2	276 04.7	−16 00.9	117 48.2	+20 25.8	17 42.6	−14 00.8	48 07.9	155	−10 37.5	−113
	13	254 59.6	29 18.9	29.2	291 05.5	16 00.3	132 50.7	25.8	32 44.8	00.9	62 42.4	153	10 48.8	−112
	14	270 02.1	44 22.6	28.2	306 06.2	15 59.7	147 53.2	25.9	47 47.0	01.0	77 16.7	154	11 00.0	−111
	15	285 04.6	59 26.2	·· 27.2	321 07.0	·· 59.0	162 55.7	·· 25.9	62 49.1	·· 01.1	91 51.1	153	·11 11.1	−111
	16	300 07.0	74 29.8	26.2	336 07.8	58.4	177 58.2	25.9	77 51.3	01.1	106 25.4	154	11 22.2	−111
	17	315 09.5	89 33.4	25.2	351 08.5	57.8	193 00.7	25.9	92 53.5	01.2	120 59.8	152	11 33.3	−110
	18	330 12.0	104 37.0	−19 24.2	6 09.3	−15 57.2	208 03.2	+20 25.9	107 55.7	−14 01.3	135 34.0	153	−11 44.3	−109
	19	345 14.4	119 40.6	23.2	21 10.1	56.5	223 05.7	25.9	122 57.8	01.4	150 08.3	152	11 55.2	−109
	20	0 16.9	134 44.3	22.2	36 10.8	55.9	238 08.2	26.0	138 00.0	01.5	164 42.5	152	12 06.1	−109
	21	15 19.4	149 47.9	·· 21.3	51 11.6	·· 55.3	253 10.7	·· 26.0	153 02.2	·· 01.6	179 16.7	151	·12 17.0	−108
	22	30 21.8	164 51.5	20.3	66 12.4	54.6	268 13.2	26.0	168 04.4	01.7	193 50.8	152	12 27.8	−107
	23	45 24.3	179 55.1	19.3	81 13.1	54.0	283 15.8	26.0	183 06.5	01.7	208 25.0	151	12 38.5	−107
22	0	60 26.7	194 58.7	−19 18.3	96 13.9	−15 53.4	298 18.3	+20 26.0	198 08.7	−14 01.8	222 59.1	150	−12 49.2	−106
	1	75 29.2	210 02.3	17.3	111 14.7	52.8	313 20.8	26.0	213 10.9	01.9	237 33.1	150	12 59.8	−106
	2	90 31.7	225 05.8	16.3	126 15.4	52.1	328 23.3	26.0	228 13.1	02.0	252 07.1	150	13 10.4	−105
	3	105 34.1	240 09.4	·· 15.3	141 16.2	·· 51.5	343 25.8	·· 26.1	243 15.2	·· 02.1	266 41.1	150	·13 20.9	−105
	4	120 36.6	255 13.0	14.4	156 17.0	50.9	358 28.3	26.1	258 17.4	02.2	281 15.1	149	13 31.4	−104
	5	135 39.1	270 16.6	13.4	171 17.7	50.2	13 30.8	26.1	273 19.6	02.2	295 49.0	149	13 41.8	−104
	6	150 41.5	285 20.2	−19 12.4	186 18.5	−15 49.6	28 33.3	+20 26.1	288 21.8	−14 02.3	310 22.9	148	−13 52.2	−103
	7	165 44.0	300 23.7	11.4	201 19.3	49.0	43 35.8	26.1	303 23.9	02.4	324 56.7	148	14 02.5	−103
	8	180 46.5	315 27.3	10.4	216 20.0	48.4	58 38.3	26.1	318 26.1	02.5	339 30.5	148	14 12.8	−101
	9	195 48.9	330 30.9	·· 09.5	231 20.8	·· 47.7	73 40.8	·· 26.2	333 28.3	·· 02.6	354 04.3	147	·14 22.9	−102
	10	210 51.4	345 34.5	08.5	246 21.6	47.1	88 43.3	26.2	348 30.5	02.7	8 38.0	147	14 33.1	−100
	11	225 53.8	0 38.0	07.5	261 22.3	46.5	103 45.8	26.2	3 32.6	02.8	23 11.7	147	14 43.1	−100
	12	240 56.3	15 41.6	−19 06.5	276 23.1	−15 45.8	118 48.3	+20 26.2	18 34.8	−14 02.8	37 45.4	146	−14 53.1	−100
	13	255 58.8	30 45.1	05.5	291 23.9	45.2	133 50.8	26.2	33 37.0	02.9	52 19.0	145	15 03.1	− 99
	14	271 01.2	45 48.7	04.6	306 24.6	44.6	148 53.4	26.2	48 39.2	03.0	66 52.5	146	15 13.0	− 98
	15	286 03.7	60 52.2	·· 03.6	321 25.4	·· 43.9	163 55.9	·· 26.3	63 41.3	·· 03.1	81 26.1	145	·15 22.8	− 98
	16	301 06.2	75 55.8	02.6	336 26.2	43.3	178 58.4	26.3	78 43.5	03.2	95 59.6	144	15 32.6	− 96
	17	316 08.6	90 59.3	01.6	351 26.9	42.7	194 00.9	26.3	93 45.7	03.3	110 33.0	144	15 42.2	− 97
	18	331 11.1	106 02.9	−19 00.7	6 27.7	−15 42.0	209 03.4	+20 26.3	108 47.9	−14 03.4	125 06.4	144	−15 51.9	− 95
	19	346 13.6	121 06.4	18 59.7	21 28.5	41.4	224 05.9	26.3	123 50.0	03.4	139 39.8	143	16 01.4	− 95
	20	1 16.0	136 09.9	58.7	36 29.2	40.8	239 08.4	26.3	138 52.2	03.5	154 13.1	142	16 10.9	− 94
	21	16 18.5	151 13.5	·· 57.8	51 30.0	·· 40.1	254 10.9	·· 26.4	153 54.4	·· 03.6	168 46.3	143	·16 20.3	− 94
	22	31 21.0	166 17.0	56.8	66 30.8	39.5	269 13.4	26.4	168 56.6	03.7	183 19.6	141	16 29.7	− 93
	23	46 23.4	181 20.5	55.8	81 31.5	38.9	284 16.0	26.4	183 58.7	03.8	197 52.7	142	16 39.0	− 92
23	0	61 25.9	196 24.1	−18 54.8	96 32.3	−15 38.2	299 18.5	+20 26.4	199 00.9	−14 03.9	212 25.9	141	−16 48.2	− 92
	1	76 28.3	211 27.6	53.9	111 33.1	37.6	314 21.0	26.4	214 03.1	03.9	226 59.0	140	16 57.4	− 90
	2	91 30.8	226 31.1	52.9	126 33.8	37.0	329 23.5	26.4	229 05.3	04.0	241 32.0	140	17 06.4	− 90
	3	106 33.3	241 34.6	·· 51.9	141 34.6	·· 36.3	344 26.0	·· 26.5	244 07.4	·· 04.1	256 05.0	140	·17 15.4	− 90
	4	121 35.7	256 38.1	51.0	156 35.4	35.7	359 28.5	26.5	259 09.6	04.2	270 38.0	139	17 24.4	− 88
	5	136 38.2	271 41.6	50.0	171 36.1	35.1	14 31.0	26.5	274 11.8	04.3	285 10.9	138	17 33.2	− 88
	6	151 40.7	286 45.1	−18 49.1	186 36.9	−15 34.4	29 33.6	+20 26.5	289 14.0	−14 04.4	299 43.7	139	−17 42.0	− 87
	7	166 43.1	301 48.6	48.1	201 37.7	33.8	44 36.1	26.5	304 16.1	04.5	314 16.6	137	17 50.7	− 87
	8	181 45.6	316 52.1	47.1	216 38.4	33.2	59 38.6	26.6	319 18.3	04.5	328 49.3	137	17 59.4	− 85
	9	196 48.1	331 55.6	·· 46.2	231 39.2	·· 32.5	74 41.1	·· 26.6	334 20.5	·· 04.6	343 22.0	137	·18 07.9	− 85
	10	211 50.5	346 59.1	45.2	246 40.0	31.9	89 43.6	26.6	349 22.7	04.7	357 54.7	136	18 16.4	− 84
	11	226 53.0	2 02.6	44.3	261 40.7	31.3	104 46.1	26.6	4 24.8	04.8	12 27.3	136	18 24.8	− 84
	12	241 55.5	17 06.1	−18 43.3	276 41.5	−15 30.6	119 48.7	+20 26.6	19 27.0	−14 04.9	26 59.9	135	−18 33.2	− 82
	13	256 57.9	32 09.5	42.3	291 42.3	30.0	134 51.2	26.6	34 29.2	05.0	41 32.4	135	18 41.4	− 82
	14	272 00.4	47 13.0	41.4	306 43.1	29.3	149 53.7	26.7	49 31.4	05.0	56 04.9	134	18 49.6	− 81
	15	287 02.8	62 16.5	·· 40.4	321 43.8	·· 28.7	164 56.2	·· 26.7	64 33.5	·· 05.1	70 37.3	134	·18 57.7	− 80
	16	302 05.3	77 20.0	39.5	336 44.6	28.1	179 58.7	26.7	79 35.7	05.2	85 09.7	134	19 05.7	− 79
	17	317 07.8	92 23.4	38.5	351 45.4	27.4	195 01.3	26.7	94 37.9	05.3	99 42.1	132	19 13.6	− 78
	18	332 10.2	107 26.9	−18 37.6	6 46.1	−15 26.8	210 03.8	+20 26.7	109 40.1	−14 05.4	114 14.3	133	−19 21.4	− 78
	19	347 12.7	122 30.4	36.6	21 46.9	26.2	225 06.3	26.8	124 42.2	05.5	128 46.6	132	19 29.2	− 77
	20	2 15.2	137 33.8	35.7	36 47.7	25.5	240 08.8	26.8	139 44.4	05.6	143 18.8	131	19 36.9	− 76
	21	17 17.6	152 37.3	·· 34.7	51 48.4	·· 24.9	255 11.3	·· 26.8	154 46.6	·· 05.6	157 50.9	131	·19 44.5	− 75
	22	32 20.1	167 40.7	33.8	66 49.2	24.2	270 13.9	26.8	169 48.8	05.7	172 23.0	130	19 52.0	− 74
	23	47 22.6	182 44.2	32.8	81 50.0	23.6	285 16.4	26.8	184 50.9	05.8	186 55.0	130	19 59.4	− 73
	24	62 25.0	197 47.6	−18 31.9	96 50.7	−15 23.0	300 18.9	+20 26.8	199 53.1	−14 05.9	201 27.0	129	−20 06.7	− 73
code		—	+ 35	+ 10	+ 8	+ 6	+ 25	0	+ 22	− 1				

GMT		SUN GHA	SUN Dec.
	h	° ′	° ′
21	0	183 34.6	−19 45.0
	1	198 34.4	45.6
	2	213 34.2	46.1
	3	228 34.1 ••	46.7
	4	243 33.9	47.3
	5	258 33.8	47.8
	6	273 33.6	−19 48.4
	7	288 33.5	49.0
	8	303 33.3	49.5
	9	318 33.2 ••	50.1
	10	333 33.0	50.6
	11	348 32.9	51.2
	12	3 32.7	−19 51.7
	13	18 32.6	52.3
	14	33 32.4	52.9
	15	48 32.2 ••	53.4
	16	63 32.1	54.0
	17	78 31.9	54.5
	18	93 31.8	−19 55.1
	19	108 31.6	55.6
	20	123 31.5	56.2
	21	138 31.3 ••	56.7
	22	153 31.1	57.3
	23	168 31.0	57.8
22	0	183 30.8	−19 58.4
	1	198 30.7	58.9
	2	213 30.5	19 59.5
	3	228 30.3	·20 00.0
	4	243 30.2	00.6
	5	258 30.0	01.1
	6	273 29.8	−20 01.6
	7	288 29.7	02.2
	8	303 29.5	02.7
	9	318 29.4 ••	03.3
	10	333 29.2	03.8
	11	348 29.0	04.4
	12	3 28.9	−20 04.9
	13	18 28.7	05.4
	14	33 28.5	06.0
	15	48 28.4 ••	06.5
	16	63 28.2	07.1
	17	78 28.0	07.6
	18	93 27.9	−20 08.1
	19	108 27.7	08.7
	20	123 27.5	09.2
	21	138 27.4 ••	09.7
	22	153 27.2	10.3
	23	168 27.0	10.8
23	0	183 26.9	−20 11.3
	1	198 26.7	11.9
	2	213 26.5	12.4
	3	228 26.4 ••	12.9
	4	243 26.2	13.5
	5	258 26.0	14.0
	6	273 25.9	−20 14.5
	7	288 25.7	15.1
	8	303 25.5	15.6
	9	318 25.3 ••	16.1
	10	333 25.2	16.6
	11	348 25.0	17.2
	12	3 24.8	−20 17.7
	13	18 24.7	18.2
	14	33 24.5	18.7
	15	48 24.3 ••	19.3
	16	63 24.1	19.8
	17	78 24.0	20.3
	18	93 23.8	−20 20.8
	19	108 23.6	21.4
	20	123 23.4	21.9
	21	138 23.3 ••	22.4
	22	153 23.1	22.9
	23	168 22.9	23.4
	24	183 22.7	−20 24.0
code		—	− 5

STARS No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.1	−40 29.0
5	Achernar	335 58.7	−57 27.9
30	Acrux	173 59.0	−62 50.8
19	Adhara	255 46.8	−28 54.4
10	Aldebaran	291 39.4	+16 25.3
32	Alioth	166 59.4	+56 12.0
34	Alkaid	153 33.8	+49 32.1
55	Al Na'ir	28 38.7	−47 10.9
15	Alnilam	276 30.6	− 1 13.6
25	Alphard	218 39.2	− 8 27.7
41	Alphecca	126 48.5	+26 51.9
1	Alpheratz	358 28.8	+28 50.8
51	Altair	62 51.2	+ 8 45.0
2	Ankaa	353 58.6	−42 33.1
42	Antares	113 20.5	−26 20.0
37	Arcturus	146 36.1	+19 24.9
43	Atria	109 02.4	−68 56.9
22	Avior	234 35.8	−59 21.6
13	Bellatrix	279 18.8	+ 6 18.7
16	Betelg'se	271 48.5	+ 7 24.1
17	Canopus	264 15.2	−52 40.0
12	Capella	281 38.9	+45 57.3
53	Deneb	50 01.6	+45 07.4
28	Denebola	183 18.5	+14 49.3
4	Diphda	349 39.6	−18 13.9
27	Dubhe	194 45.4	+61 59.3
14	Elnath	279 07.8	+28 34.3
47	Eltanin	91 07.0	+51 29.8
54	Enif	34 30.3	+ 9 40.2
56	Fomalhaut	16 12.2	−29 51.7
31	Gacrux	172 50.4	−56 51.5
29	Gienah	176 37.7	−17 17.4
35	Hadar	149 51.0	−60 09.3
6	Hamal	328 50.1	+23 15.2
48	Kaus Aust.	84 42.4	−34 24.5
40	Kochab	137 18.9	+74 20.2
57	Markab	14 22.0	+14 58.0
8	Menkar	315 00.7	+ 3 55.0
36	Menkent	148 59.8	−36 08.9
24	Miapl'dus	221 49.0	−69 31.6
9	Mirfak	309 42.8	+49 42.3
50	Nunki	76 53.0	−26 21.3
52	Peacock	54 28.5	−56 53.1
21	Pollux	244 21.1	+28 08.1
20	Procyon	245 45.4	+ 5 20.5
46	R'alhague	96 47.5	+12 35.6
26	Regulus	208 30.2	+12 11.2
11	Rigel	281 53.9	− 8 15.0
38	Rigil Kent.	140 52.5	−60 39.0
44	Sabik	103 03.2	−15 40.2
3	Schedar	350 30.4	+56 17.8
45	Shaula	97 21.9	−37 04.4
18	Sirius	259 12.1	−16 39.0
33	Spica	159 17.8	−10 55.6
23	Suhail	223 24.7	−43 14.8
49	Vega	81 09.0	+38 44.6
39	Zub'g'bi	137 54.4	−15 51.3

Lat.	Sunrise	Twlt. begins	Moonrise 21	22	23	24
N °	h m	h m	h m	h m	h m	h m
72	■	5 57	4 36	6 42	■	■
70	10 41	5 53	4 21	6 12	8 22	■
68	9 45	5 50	4 09	5 50	7 39	9 53
66	9 12	5 46	3 59	5 33	7 10	8 54
64	8 48	5 44	3 51	5 19	6 48	8 20
62	8 29	5 41	3 44	5 07	6 31	7 55
60	8 14	5 39	3 38	4 57	6 17	7 36
58	8 01	5 36	3 33	4 49	6 05	7 20
56	7 50	5 34	3 28	4 41	5 55	7 07
54	7 40	5 31	3 24	4 35	5 45	6 55
52	7 31	5 29	3 20	4 29	5 37	6 45
50	7 23	5 28	3 17	4 23	5 30	6 35
45	7 06	5 22	3 09	4 12	5 14	6 16
40	6 53	5 16	3 03	4 02	5 02	6 00
35	6 41	5 12	2 58	3 54	4 51	5 47
30	6 30	5 07	2 53	3 47	4 41	5 36
20	6 13	4 55	2 45	3 35	4 25	5 16
10	5 57	4 43	2 38	3 24	4 11	4 59
0	5 43	4 29	2 32	3 14	3 58	4 43
10	5 28	4 12	2 25	3 04	3 45	4 28
20	5 12	3 51	2 19	2 54	3 31	4 11
30	4 53	3 21	2 11	2 42	3 15	3 52
35	4 42	3 03	2 07	2 35	3 06	3 41
40	4 30	2 37	2 01	2 27	2 56	3 28
45	4 15	2 03	1 56	2 18	2 43	3 13
50	3 57	1 03	1 49	2 07	2 29	2 55
52	3 48	////	1 46	2 03	2 22	2 46
54	3 38	////	1 42	1 57	2 15	2 36
56	3 27	////	1 39	1 51	2 06	2 26
58	3 15	////	1 34	1 44	1 57	2 13
60	3 00	////	1 30	1 37	1 46	1 59
S						

Lat.	Sunset	Twlt. ends	Moonset 21	22	23	24
N °	h m	h m	h m	h m	h m	h m
72	■	17 31	12 24	11 48	■	■
70	12 51	17 37	12 42	12 19	11 41	■
68	13 47	17 40	12 55	12 43	12 25	11 47
66	14 19	17 42	13 07	13 01	12 55	12 47
64	14 43	17 46	13 16	13 16	13 17	13 21
62	15 02	17 49	13 24	13 28	13 35	13 46
60	15 18	17 52	13 31	13 39	13 50	14 06
58	15 31	17 54	13 38	13 48	14 03	14 22
56	15 42	17 56	13 43	13 57	14 14	14 36
54	15 52	17 59	13 48	14 04	14 23	14 48
52	16 01	18 01	13 53	14 10	14 32	14 59
50	16 09	18 04	13 57	14 16	14 40	15 09
45	16 25	18 08	14 06	14 29	14 57	15 29
40	16 39	18 14	14 13	14 40	15 10	15 45
35	16 51	18 19	14 20	14 49	15 22	15 59
30	17 01	18 24	14 25	14 57	15 32	16 11
20	17 19	18 36	14 35	15 11	15 50	16 31
10	17 35	18 49	14 44	15 23	16 05	16 49
0	17 50	19 03	14 52	15 35	16 20	17 06
10	18 04	19 20	15 00	15 47	16 34	17 23
20	18 21	19 42	15 09	15 59	16 50	17 41
30	18 39	20 11	15 19	16 13	17 08	18 02
35	18 50	20 31	15 25	16 21	17 18	18 14
40	19 03	20 57	15 32	16 31	17 30	18 28
45	19 18	21 32	15 39	16 42	17 44	18 45
50	19 36	22 34	15 49	16 55	18 01	19 06
52	19 45	////	15 53	17 02	18 10	19 16
54	19 55	////	15 58	17 08	18 19	19 27
56	20 06	////	16 03	17 16	18 29	19 40
58	20 18	////	16 09	17 25	18 41	19 55
60	20 34	////	16 16	17 35	18 55	20 12
S						

GMT	Equation of Time (App.—Mean) 21	22	23
h	m s	m s	m s
0	+14 18.5	+14 03.6	+13 47.8
6	+14 14.9	+13 59.7	+13 43.8
12	+14 11.2	+13 55.8	+13 39.7
18	+14 07.4	+13 51.8	+13 35.5
24	+14 03.6	+13 47.8	+13 31.3

GMT of Transit
Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
21	8 42	11 03	17 35	4 10	10 49
22	9 24	10 58	17 34	4 06	10 46
23	10 09	10 52	17 33	4 02	10 42
24	10 55	10 46	17 32	3 58	10 39

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
30	0.5	0.5	0.1
45	0.5	0.4	0.1
60	0.5	0.3	0.1
75	0.5	0.2	0.0
90	0.5	0.1	0.0

Moon's Lower Limb
Add

Alt.	21	22	23
°	′	′	′
0			
	12.1	11.7	11.7
4			
	12.1	11.7	11.7
8			
	12.2	11.8	11.8
12			
	12.2	11.8	11.8
16			
	12.2	11.9	11.9
20			
	12.3	12.0	12.0
24			
	12.4	12.0	12.0
28			
	12.5	12.1	12.1
32			
	12.6	12.2	12.2
36			
	12.7	12.4	12.4
40			
	12.8	12.5	12.5
44			
	12.9	12.6	12.6
48			
	13.1	12.8	12.8
52			
	13.2	13.0	13.0
56			
	13.4	13.1	13.1
60			
	13.5	13.3	13.3
64			
	13.7	13.5	13.5
68			
	13.9	13.7	13.7
72			
	14.1	13.9	13.9
76			
	14.3	14.1	14.1
80			
	14.4	14.3	14.3
84			
	14.6	14.5	14.5
88			
	14.8	14.7	14.7
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	21	22	23
°	′	′	′
0			
	17.5	17.7	17.7
4			
	17.5	17.7	17.7
8			
	17.5	17.7	17.7
12			
	17.4	17.6	17.6
16			
	17.4	17.6	17.6
20			
	17.3	17.5	17.5
24			
	17.2	17.4	17.4
28			
	17.2	17.3	17.3
32			
	17.1	17.2	17.2
36			
	16.9	17.1	17.1
40			
	16.8	17.0	17.0
44			
	16.7	16.8	16.8
48			
	16.6	16.7	16.7
52			
	16.4	16.5	16.5
56			
	16.2	16.3	16.3
60			
	16.1	16.1	16.1
64			
	15.9	16.0	16.0
68			
	15.7	15.8	15.8
72			
	15.6	15.6	15.6
76			
	15.4	15.4	15.4
80			
	15.2	15.2	15.2
84			
	15.0	14.9	14.9
88			
	14.9	14.8	14.8
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −3.6 GHA	VENUS Dec.	MARS 0.4 GHA	MARS Dec.	JUPITER −2.0 GHA	JUPITER Dec.	SATURN 0.8 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
24 0	62 25.0	197 47.6	−18 31.9	96 50.7	−15 23.0	300 18.9	+20 26.8	199 53.1	−14 05.9	201 27.0	129	−20 06.7	−73
1	77 27.5	212 51.1	30.9	111 51.5	22.3	315 21.4	26.9	214 55.3	06.0	215 58.9	129	20 14.0	−72
2	92 29.9	227 54.5	30.0	126 52.3	21.7	330 24.0	26.9	229 57.5	06.1	230 30.8	129	20 21.2	−70
3	107 32.4	242 57.9	·· 29.0	141 53.0	·· 21.0	345 26.5	·· 26.9	244 59.7	·· 06.1	245 02.7	128	·20 28.2	−70
4	122 34.9	258 01.4	28.1	156 53.8	20.4	0 29.0	26.9	260 01.8	06.2	259 34.5	127	20 35.2	−69
5	137 37.3	273 04.8	27.1	171 54.6	19.8	15 31.5	26.9	275 04.0	06.3	274 06.2	127	20 42.1	−68
6	152 39.8	288 08.2	−18 26.2	186 55.3	−15 19.1	30 34.0	+20 27.0	290 06.2	−14 06.4	288 37.9	126	−20 48.9	−67
7	167 42.3	303 11.6	25.3	201 56.1	18.5	45 36.6	27.0	305 08.4	06.5	303 09.5	126	20 55.6	−66
8	182 44.7	318 15.1	24.3	216 56.9	17.8	60 39.1	27.0	320 10.5	06.6	317 41.1	126	21 02.2	−66
9	197 47.2	333 18.5	·· 23.4	231 57.7	·· 17.2	75 41.6	·· 27.0	335 12.7	·· 06.6	332 12.7	125	·21 08.8	−64
10	212 49.7	348 21.9	22.5	246 58.4	16.6	90 44.1	27.0	350 14.9	06.7	346 44.2	124	21 15.2	−63
11	227 52.1	3 25.3	21.5	261 59.2	15.9	105 46.7	27.1	5 17.1	06.8	1 15.6	125	21 21.5	−63
12	242 54.6	18 28.7	−18 20.6	277 00.0	−15 15.3	120 49.2	+20 27.1	20 19.2	−14 06.9	15 47.1	123	−21 27.8	−61
13	257 57.1	33 32.1	19.7	292 00.7	14.6	135 51.7	27.1	35 21.4	07.0	30 18.4	123	21 33.9	−61
14	272 59.5	48 35.5	18.7	307 01.5	14.0	150 54.3	27.1	50 23.6	07.1	44 49.7	123	21 40.0	−59
15	288 02.0	63 38.9	·· 17.8	322 02.3	·· 13.4	165 56.8	·· 27.1	65 25.8	·· 07.2	59 21.0	122	·21 45.9	−59
16	303 04.4	78 42.3	16.9	337 03.0	12.7	180 59.3	27.2	80 27.9	07.2	73 52.2	122	21 51.8	−58
17	318 06.9	93 45.6	15.9	352 03.8	12.1	196 01.8	27.2	95 30.1	07.3	88 23.4	121	21 57.6	−56
18	333 09.4	108 49.0	−18 15.0	7 04.6	−15 11.4	211 04.4	+20 27.2	110 32.3	−14 07.4	102 54.5	121	−22 03.2	−56
19	348 11.8	123 52.4	14.1	22 05.3	10.8	226 06.9	27.2	125 34.5	07.5	117 25.6	120	22 08.8	−55
20	3 14.3	138 55.8	13.2	37 06.1	10.1	241 09.4	27.2	140 36.7	07.6	131 56.6	120	22 14.3	−53
21	18 16.8	153 59.2	·· 12.2	52 06.9	·· 09.5	256 12.0	·· 27.3	155 38.8	·· 07.7	146 27.6	119	·22 19.6	−53
22	33 19.2	169 02.5	11.3	67 07.7	08.9	271 14.5	27.3	170 41.0	07.7	160 58.5	119	22 24.9	−51
23	48 21.7	184 05.9	10.4	82 08.4	08.2	286 17.0	27.3	185 43.2	07.8	175 29.4	119	22 30.0	−51
25 0	63 24.2	199 09.3	−18 09.5	97 09.2	−15 07.6	301 19.5	+20 27.3	200 45.4	−14 07.9	190 00.3	118	−22 35.1	−50
1	78 26.6	214 12.6	08.5	112 10.0	06.9	316 22.1	27.3	215 47.5	08.0	204 31.1	118	22 40.1	−48
2	93 29.1	229 16.0	07.6	127 10.7	06.3	331 24.6	27.4	230 49.7	08.1	219 01.9	117	22 44.9	−48
3	108 31.6	244 19.3	·· 06.7	142 11.5	·· 05.6	346 27.1	·· 27.4	245 51.9	·· 08.2	233 32.6	117	·22 49.7	−46
4	123 34.0	259 22.7	05.8	157 12.3	05.0	1 29.7	27.4	260 54.1	08.2	248 03.3	116	22 54.3	−45
5	138 36.5	274 26.0	04.9	172 13.0	04.3	16 32.2	27.4	275 56.2	08.3	262 33.9	116	22 58.8	−45
6	153 38.9	289 29.3	−18 04.0	187 13.8	−15 03.7	31 34.7	+20 27.5	290 58.4	−14 08.4	277 04.5	116	−23 03.3	−43
7	168 41.4	304 32.7	03.1	202 14.6	03.1	46 37.3	27.5	306 00.6	08.5	291 35.1	115	23 07.6	−42
8	183 43.9	319 36.0	02.1	217 15.4	02.4	61 39.8	27.5	321 02.8	08.6	306 05.6	115	23 11.8	−41
9	198 46.3	334 39.3	·· 01.2	232 16.1	·· 01.8	76 42.3	·· 27.5	336 04.9	·· 08.7	320 36.1	114	·23 15.9	−41
10	213 48.8	349 42.7	18 00.3	247 16.9	01.1	91 44.9	27.5	351 07.1	08.7	335 06.5	114	23 20.0	−39
11	228 51.3	4 46.0	17 59.4	262 17.7	15 00.5	106 47.4	27.6	6 09.3	08.8	349 36.9	114	23 23.9	−37
12	243 53.7	19 49.3	−17 58.5	277 18.4	−14 59.8	121 49.9	+20 27.6	21 11.5	−14 08.9	4 07.3	113	−23 27.6	−37
13	258 56.2	34 52.6	57.6	292 19.2	59.2	136 52.5	27.6	36 13.7	09.0	18 37.6	113	23 31.3	−36
14	273 58.7	49 55.9	56.7	307 20.0	58.5	151 55.0	27.6	51 15.8	09.1	33 07.9	113	23 34.9	−35
15	289 01.1	64 59.2	·· 55.8	322 20.8	·· 57.9	166 57.6	·· 27.7	66 18.0	·· 09.2	47 38.2	112	·23 38.4	−33
16	304 03.6	80 02.5	54.9	337 21.5	57.2	182 00.1	27.7	81 20.2	09.2	62 08.4	112	23 41.7	−33
17	319 06.1	95 05.8	54.0	352 22.3	56.6	197 02.6	27.7	96 22.4	09.3	76 38.6	112	23 45.0	−31
18	334 08.5	110 09.1	−17 53.1	7 23.1	−14 55.9	212 05.2	+20 27.7	111 24.5	−14 09.4	91 08.8	111	−23 48.1	−30
19	349 11.0	125 12.4	52.2	22 23.8	55.3	227 07.7	27.7	126 26.7	09.5	105 38.9	111	23 51.1	−29
20	4 13.4	140 15.7	51.3	37 24.6	54.6	242 10.2	27.8	141 28.9	09.6	120 09.0	110	23 54.0	−28
21	19 15.9	155 19.0	·· 50.4	52 25.4	·· 54.0	257 12.8	·· 27.8	156 31.1	·· 09.7	134 39.0	111	·23 56.8	−27
22	34 18.4	170 22.3	49.5	67 26.1	53.3	272 15.3	27.8	171 33.3	09.7	149 09.1	110	23 59.5	−26
23	49 20.8	185 25.5	48.6	82 26.9	52.7	287 17.9	27.8	186 35.4	09.8	163 39.1	109	24 02.1	−24
26 0	64 23.3	200 28.8	−17 47.7	97 27.7	−14 52.0	302 20.4	+20 27.9	201 37.6	−14 09.9	178 09.0	110	−24 04.5	−23
1	79 25.8	215 32.1	46.8	112 28.5	51.4	317 22.9	27.9	216 39.8	10.0	192 39.0	109	24 06.8	−23
2	94 28.2	230 35.4	46.0	127 29.2	50.7	332 25.5	27.9	231 42.0	10.1	207 08.9	109	24 09.1	−21
3	109 30.7	245 38.6	·· 45.1	142 30.0	·· 50.1	347 28.0	·· 27.9	246 44.1	·· 10.2	221 38.8	108	·24 11.2	−20
4	124 33.2	260 41.9	44.2	157 30.8	49.4	2 30.6	27.9	261 46.3	10.2	236 08.6	109	24 13.2	−18
5	139 35.6	275 45.1	43.3	172 31.5	48.8	17 33.1	28.0	276 48.5	10.3	250 38.5	108	24 15.0	−18
6	154 38.1	290 48.4	−17 42.4	187 32.3	−14 48.1	32 35.6	+20 28.0	291 50.7	−14 10.4	265 08.3	108	−24 16.8	−17
7	169 40.5	305 51.6	41.5	202 33.1	47.5	47 38.2	28.0	306 52.9	10.5	279 38.1	107	24 18.5	−15
8	184 43.0	320 54.9	40.7	217 33.9	46.8	62 40.7	28.0	321 55.0	10.6	294 07.8	108	24 20.0	−14
9	199 45.5	335 58.1	·· 39.8	232 34.6	·· 46.2	77 43.3	·· 28.1	336 57.2	·· 10.7	308 37.6	107	·24 21.4	−13
10	214 47.9	351 01.3	38.9	247 35.4	45.5	92 45.8	28.1	351 59.4	10.7	323 07.3	107	24 22.7	−12
11	229 50.4	6 04.6	38.0	262 36.2	44.9	107 48.4	28.1	7 01.6	10.8	337 37.0	107	24 23.9	−10
12	244 52.9	21 07.8	−17 37.2	277 36.9	−14 44.2	122 50.9	+20 28.1	22 03.7	−14 10.9	352 06.7	107	−24 24.9	−10
13	259 55.3	36 11.0	36.3	292 37.7	43.6	137 53.4	28.2	37 05.9	11.0	6 36.4	106	24 25.9	−8
14	274 57.8	51 14.2	35.4	307 38.5	42.9	152 56.0	28.2	52 08.1	11.1	21 06.0	106	24 26.7	−7
15	290 00.3	66 17.5	·· 34.6	322 39.3	·· 42.3	167 58.5	·· 28.2	67 10.3	·· 11.1	35 35.6	107	·24 27.4	−6
16	305 02.7	81 20.7	33.7	337 40.0	41.6	183 01.1	28.2	82 12.5	11.2	50 05.3	106	24 28.0	−5
17	320 05.2	96 23.9	32.8	352 40.8	41.0	198 03.6	28.2	97 14.6	11.3	64 34.9	106	24 28.5	−3
18	335 07.7	111 27.1	−17 32.0	7 41.6	−14 40.3	213 06.2	+20 28.3	112 16.8	−14 11.4	79 04.5	105	−24 28.8	−3
19	350 10.1	126 30.3	31.1	22 42.4	39.7	228 08.7	28.3	127 19.0	11.5	93 34.0	106	24 29.1	−1
20	5 12.6	141 33.5	30.2	37 43.1	39.0	243 11.3	28.3	142 21.2	11.6	108 03.6	105	24 29.2	0
21	20 15.0	156 36.7	·· 29.4	52 43.9	·· 38.4	258 13.8	·· 28.3	157 23.3	·· 11.6	122 33.1	106	·24 29.2	+1
22	35 17.5	171 39.9	28.5	67 44.7	37.7	273 16.4	28.4	172 25.5	11.7	137 02.7	105	24 29.1	+3
23	50 20.0	186 43.1	27.6	82 45.4	37.1	288 18.9	28.4	187 27.7	11.8	151 32.2	105	24 28.8	+4
24	65 22.4	201 46.2	−17 26.8	97 46.2	−14 36.4	303 21.5	+20 28.4	202 29.9	−14 11.9	166 01.7	106	−24 28.4	+4
code	—	+ 33	+ 9	+ 8	+ 6	+ 26	0	+ 22	− 1				

GMT		SUN GHA	SUN Dec.
h		° ′	° ′
24	0	183 22.7	−20 24.0
	1	198 22.6	24.5
	2	213 22.4	25.0
	3	228 22.2 ••	25.5
	4	243 22.0	26.0
	5	258 21.8	26.5
	6	273 21.7	−20 27.1
	7	288 21.5	27.6
	8	303 21.3	28.1
	9	318 21.1 ••	28.6
	10	333 20.9	29.1
	11	348 20.8	29.6
	12	3 20.6	−20 30.1
	13	18 20.4	30.6
	14	33 20.2	31.1
	15	48 20.0 ••	31.6
	16	63 19.9	32.2
	17	78 19.7	32.7
	18	93 19.5	−20 33.2
	19	108 19.3	33.7
	20	123 19.1	34.2
	21	138 18.9 ••	34.7
	22	153 18.8	35.2
	23	168 18.6	35.7
25	0	183 18.4	−20 36.2
	1	198 18.2	36.7
	2	213 18.0	37.2
	3	228 17.8 ••	37.7
	4	243 17.6	38.2
	5	258 17.5	38.7
	6	273 17.3	−20 39.2
	7	288 17.1	39.7
	8	303 16.9	40.2
	9	318 16.7 ••	40.7
	10	333 16.5	41.2
	11	348 16.3	41.7
	12	3 16.2	−20 42.2
	13	18 16.0	42.7
	14	33 15.8	43.1
	15	48 15.6 ••	43.6
	16	63 15.4	44.1
	17	78 15.2	44.6
	18	93 15.0	−20 45.1
	19	108 14.8	45.6
	20	123 14.6	46.1
	21	138 14.4 ••	46.6
	22	153 14.2	47.1
	23	168 14.1	47.5
26	0	183 13.9	−20 48.0
	1	198 13.7	48.5
	2	213 13.5	49.0
	3	228 13.3 ••	49.5
	4	243 13.1	50.0
	5	258 12.9	50.5
	6	273 12.7	−20 50.9
	7	288 12.5	51.4
	8	303 12.3	51.9
	9	318 12.1 ••	52.4
	10	333 11.9	52.9
	11	348 11.7	53.3
	12	3 11.5	−20 53.8
	13	18 11.3	54.3
	14	33 11.1	54.8
	15	48 10.9 ••	55.2
	16	63 10.7	55.7
	17	78 10.5	56.2
	18	93 10.3	−20 56.7
	19	108 10.1	57.1
	20	123 09.9	57.6
	21	138 09.7 ••	58.1
	22	153 09.5	58.6
	23	168 09.3	59.0
	24	183 09.1	−20 59.5
code		—	− 5

STARS No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.1	−40 29.0
5	Achernar	335 58.8	−57 28.0
30	Acrux	173 59.0	−62 50.8
19	Adhara	255 46.7	−28 54.4
10	Aldebaran	291 39.4	+16 25.3
32	Alioth	166 59.4	+56 12.0
34	Alkaid	153 33.7	+49 32.1
55	Al Na'ir	28 38.7	−47 10.9
15	Alnilam	276 30.6	− 1 13.7
25	Alphard	218 39.1	− 8 27.7
41	Alphecca	126 48.5	+26 51.9
1	Alpheratz	358 28.8	+28 50.8
51	Altair	62 51.2	+ 8 45.0
2	Ankaa	353 58.6	−42 33.1
42	Antares	113 20.5	−26 20.0
37	Arcturus	146 36.0	+19 24.9
43	Atria	109 02.4	−68 56.9
22	Avior	234 35.8	−59 21.6
13	Bellatrix	279 18.8	+ 6 18.7
16	Betelg'se	271 48.5	+ 7 24.1
17	Canopus	264 15.2	−52 40.0
12	Capella	281 38.9	+45 57.3
53	Deneb	50 01.7	+45 07.4
28	Denebola	183 18.5	+14 49.3
4	Diphda	349 39.7	−18 13.9
27	Dubhe	194 45.4	+61 59.3
14	Elnath	279 07.8	+28 34.3
47	Eltanin	91 07.0	+51 29.7
54	Enif	34 30.3	+ 9 40.2
56	Fomalhaut	16 12.2	−29 51.7
31	Gacrux	172 50.3	−56 51.5
29	Gienah	176 37.7	−17 17.5
35	Hadar	149 50.9	−60 09.3
6	Hamal	328 50.1	+23 15.2
48	Kaus Aust.	84 42.4	−34 24.5
40	Kochab	137 18.9	+74 20.2
57	Markab	14 22.0	+14 58.0
8	Menkar	315 00.7	+ 3 55.0
36	Menkent	148 59.8	−36 08.9
24	Miapl'dus	221 49.0	−69 31.6
9	Mirfak	309 42.8	+49 42.3
50	Nunki	76 53.0	−26 21.3
52	Peacock	54 28.5	−56 53.1
21	Pollux	244 21.1	+28 08.1
20	Procyon	245 45.4	+ 5 20.5
46	R'alhague	96 47.5	+12 35.5
26	Regulus	208 30.2	+12 11.2
11	Rigel	281 53.9	− 8 15.0
38	Rigil Kent.	140 52.5	−60 39.0
44	Sabik	103 03.2	−15 40.2
3	Schedar	350 30.4	+56 17.8
45	Shaula	97 21.9	−37 04.4
18	Sirius	259 12.1	−16 39.1
33	Spica	159 17.8	−10 55.6
23	Suhail	223 24.7	−43 14.8
49	Vega	81 09.0	+38 44.6
39	Zub'g'bi	137 54.4	−15 51.3

Lat.	Sunrise	Twlt. begins	Moonrise 24	Moonrise 25	Moonrise 26	Moonrise 27
N °	h m	h m	h m	h m	h m	h m
72	■	6 06	■	■	■	■
70	11 21	6 01	■	■	■	■
68	10 00	5 57	9 53	■	■	■
66	9 23	5 53	8 54	10 50	■	■
64	8 57	5 49	8 20	9 50	11 06	11 52
62	8 37	5 47	7 55	9 16	10 24	11 12
60	8 21	5 44	7 36	8 51	9 55	10 45
58	8 07	5 41	7 20	8 31	9 34	10 23
56	7 55	5 39	7 07	8 15	9 16	10 06
54	7 45	5 35	6 55	8 01	9 01	9 51
52	7 36	5 33	6 45	7 49	8 48	9 38
50	7 28	5 31	6 35	7 38	8 36	9 26
45	7 10	5 25	6 16	7 16	8 12	9 02
40	6 56	5 20	6 00	6 58	7 53	8 43
35	6 44	5 14	5 47	6 43	7 37	8 28
30	6 33	5 08	5 36	6 30	7 23	8 14
20	6 15	4 57	5 16	6 08	7 00	7 50
10	5 58	4 44	4 59	5 49	6 39	7 30
0	5 43	4 30	4 43	5 31	6 21	7 11
10	5 28	4 12	4 28	5 13	6 02	6 52
20	5 11	3 49	4 11	4 55	5 42	6 32
30	4 52	3 20	3 52	4 33	5 18	6 08
35	4 41	2 59	3 41	4 20	5 05	5 54
40	4 28	2 34	3 28	4 05	4 49	5 38
45	4 13	1 57	3 13	3 48	4 30	5 19
50	3 54	0 51	2 55	3 27	4 07	4 56
52	3 45	////	2 46	3 17	3 56	4 44
54	3 35	////	2 36	3 05	3 43	4 31
56	3 23	////	2 26	2 52	3 28	4 16
58	3 10	////	2 13	2 37	3 11	3 59
60 S	2 54	////	1 59	2 19	2 50	3 37

Lat.	Sunset	Twlt. ends	Moonset 24	Moonset 25	Moonset 26	Moonset 27
N °	h m	h m	h m	h m	h m	h m
72	■	17 24	■	■	■	■
70	12 13	17 31	■	■	■	■
68	13 33	17 34	11 47	■	■	■
66	14 10	17 38	12 47	12 30	■	■
64	14 36	17 42	13 21	13 31	13 58	14 57
62	14 56	17 45	13 46	14 05	14 40	15 37
60	15 12	17 48	14 06	14 30	15 09	16 04
58	15 26	17 51	14 22	14 50	15 31	16 25
56	15 38	17 54	14 36	15 07	15 48	16 43
54	15 48	17 56	14 48	15 21	16 04	16 58
52	15 57	17 58	14 59	15 33	16 17	17 10
50	16 06	18 01	15 09	15 44	16 29	17 22
45	16 23	18 07	15 29	16 07	16 52	17 45
40	16 38	18 13	15 45	16 25	17 12	18 04
35	16 50	18 19	15 59	16 41	17 28	18 20
30	17 01	18 25	16 11	16 54	17 42	18 34
20	17 19	18 36	16 31	17 17	18 05	18 57
10	17 35	18 49	16 49	17 36	18 26	19 17
0	17 51	19 05	17 06	17 55	18 45	19 35
10	18 06	19 22	17 23	18 13	19 04	19 54
20	18 22	19 44	17 41	18 33	19 24	20 14
30	18 42	20 15	18 02	18 56	19 48	20 37
35	18 53	20 35	18 14	19 09	20 02	20 50
40	19 06	21 01	18 28	19 25	20 18	21 05
45	19 21	21 38	18 45	19 43	20 37	21 24
50	19 41	22 48	19 06	20 07	21 01	21 47
52	19 50	////	19 16	20 18	21 12	21 58
54	20 00	////	19 27	20 30	21 25	22 10
56	20 11	////	19 40	20 44	21 40	22 24
58	20 25	////	19 55	21 01	21 58	22 41
60 S	20 41	////	20 12	21 22	22 19	23 01

GMT	Equation of Time (App.—Mean) 24	25	26
h	m s	m s	m s
0	+13 31.3	+13 13.9	+12 55.8
6	+13 27.0	+13 09.5	+12 51.2
12	+13 22.7	+13 05.0	+12 46.5
18	+13 18.3	+13 00.4	+12 41.8
24	+13 13.9	+12 55.8	+12 37.0

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
24	10 55	10 46	17 32	3 58	10 39
25	11 43	10 41	17 31	3 54	10 35
26	12 33	10 36	17 29	3 50	10 32
27	13 23	10 31	17 28	3 46	10 29

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.5	0.5	0.1
30	0.5	0.4	0.1
45	0.5	0.3	0.1
60	0.5	0.2	0.0
75	0.5	0.1	0.0
90			

Moon's Lower Limb Add

Alt.	24	25	26
°	′	′	′
0	11.7	11.7	12.0
4	11.7	11.7	12.0
8	11.8	11.8	12.0
12	11.8	11.8	12.1
16	11.9	11.9	12.1
20	12.0	12.0	12.2
24	12.0	12.0	12.3
28	12.1	12.1	12.4
32	12.2	12.2	12.5
36	12.4	12.4	12.6
40	12.5	12.5	12.7
44	12.6	12.6	12.8
48	12.8	12.8	13.0
52	13.0	13.0	13.1
56	13.1	13.1	13.3
60	13.3	13.3	13.5
64	13.5	13.5	13.6
68	13.7	13.7	13.8
72	13.9	13.9	14.0
76	14.1	14.1	14.2
80	14.3	14.3	14.4
84	14.5	14.5	14.6
88	14.7	14.7	14.7
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	24	25	26
°	′	′	′
0	17.7	17.7	17.6
4	17.7	17.7	17.6
8	17.7	17.7	17.5
12	17.6	17.6	17.5
16	17.6	17.6	17.5
20	17.5	17.5	17.4
24	17.4	17.4	17.3
28	17.3	17.3	17.2
32	17.2	17.2	17.1
36	17.1	17.1	17.0
40	17.0	17.0	16.9
44	16.8	16.8	16.7
48	16.7	16.7	16.6
52	16.5	16.5	16.4
56	16.3	16.3	16.3
60	16.1	16.1	16.1
64	16.0	16.0	15.9
68	15.8	15.8	15.7
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.2	15.2	15.2
84	14.9	14.9	15.0
88	14.8	14.8	14.8
90			

Subtract from table, back cover

Thanksgiving Day 25
New Moon 25

GMT	♈ GHA	VENUS −3.9 GHA	Dec.	MARS 0.4 GHA	Dec.	JUPITER −2.0 GHA	Dec.	SATURN 0.8 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
27 0	65 22.4	201 46.2	−17 26.8	97 46.2	−14 36.4	303 21.5	+20 28.4	202 29.9	−14 11.9	166 01.7	106	−24 28.4	+ 4
1	80 24.9	216 49.4	25.9	112 47.0	35.8	318 24.0	28.4	217 32.1	12.0	180 31.3	105	24 28.0	+ 6
2	95 27.4	231 52.6	25.1	127 47.8	35.1	333 26.5	28.5	232 34.2	12.1	195 00.8	105	24 27.4	+ 8
3	110 29.8	246 55.8	·· 24.2	142 48.5	·· 34.4	348 29.1	·· 28.5	247 36.4	·· 12.1	209 30.3	105	·24 26.6	+ 8
4	125 32.3	261 58.9	23.4	157 49.3	33.8	3 31.6	28.5	262 38.6	12.2	223 59.8	105	24 25.8	+ 10
5	140 34.8	277 02.1	22.5	172 50.1	33.1	18 34.2	28.5	277 40.8	12.3	238 29.3	105	24 24.8	+ 10
6	155 37.2	292 05.3	−17 21.7	187 50.9	−14 32.5	33 36.7	+20 28.6	292 43.0	−14 12.4	252 58.8	104	−24 23.8	+ 12
7	170 39.7	307 08.4	20.8	202 51.6	31.8	48 39.3	28.6	307 45.1	12.5	267 28.2	105	24 22.6	+ 14
8	185 42.2	322 11.6	20.0	217 52.4	31.2	63 41.8	28.6	322 47.3	12.6	281 57.7	105	24 21.2	+ 14
9	200 44.6	337 14.7	·· 19.2	232 53.2	·· 30.5	78 44.4	·· 28.6	337 49.5	·· 12.6	296 27.2	105	·24 19.8	+ 15
10	215 47.1	352 17.8	18.3	247 53.9	29.9	93 47.0	28.7	352 51.7	12.7	310 56.7	105	24 18.3	+ 17
11	230 49.5	7 21.0	17.5	262 54.7	29.2	108 49.5	28.7	7 53.8	12.8	325 26.2	105	24 16.6	+ 18
12	245 52.0	22 24.1	−17 16.6	277 55.5	−14 28.5	123 52.1	+20 28.7	22 56.0	−14 12.9	339 55.7	105	−24 14.8	+ 19
13	260 54.5	37 27.3	15.8	292 56.3	27.9	138 54.6	28.7	37 58.2	13.0	354 25.2	105	24 12.9	+ 21
14	275 56.9	52 30.4	15.0	307 57.0	27.2	153 57.2	28.8	53 00.4	13.0	8 54.7	105	24 10.8	+ 21
15	290 59.4	67 33.5	·· 14.1	322 57.8	·· 26.6	168 59.7	·· 28.8	68 02.6	·· 13.1	23 24.2	105	·24 08.7	+ 23
16	306 01.9	82 36.6	13.3	337 58.6	25.9	184 02.3	28.8	83 04.7	13.2	37 53.7	105	24 06.4	+ 24
17	321 04.3	97 39.7	12.5	352 59.4	25.3	199 04.8	28.8	98 06.9	13.3	52 23.2	106	24 04.0	+ 25
18	336 06.8	112 42.9	−17 11.6	8 00.1	−14 24.6	214 07.4	+20 28.9	113 09.1	−14 13.4	66 52.8	105	−24 01.5	+ 26
19	351 09.3	127 46.0	10.8	23 00.9	23.9	229 09.9	28.9	128 11.3	13.5	81 22.3	106	23 58.9	+ 28
20	6 11.7	142 49.1	10.0	38 01.7	23.3	244 12.5	28.9	143 13.5	13.5	95 51.9	105	23 56.1	+ 28
21	21 14.2	157 52.2	·· 09.2	53 02.5	·· 22.6	259 15.0	·· 28.9	158 15.6	·· 13.6	110 21.4	106	·23 53.3	+ 30
22	36 16.7	172 55.3	08.3	68 03.2	22.0	274 17.6	29.0	173 17.8	13.7	124 51.0	106	23 50.3	+ 31
23	51 19.1	187 58.4	07.5	83 04.0	21.3	289 20.2	29.0	188 20.0	13.8	139 20.6	105	23 47.2	+ 33
28 0	66 21.6	203 01.5	−17 06.7	98 04.8	−14 20.7	304 22.7	+20 29.0	203 22.2	−14 13.9	153 50.1	106	−23 43.9	+ 33
1	81 24.0	218 04.5	05.9	113 05.6	20.0	319 25.3	29.0	218 24.4	13.9	168 19.7	107	23 40.6	+ 34
2	96 26.5	233 07.6	05.1	128 06.3	19.3	334 27.8	29.1	233 26.5	14.0	182 49.4	106	23 37.2	+ 36
3	111 29.0	248 10.7	·· 04.2	143 07.1	·· 18.7	349 30.4	·· 29.1	248 28.7	·· 14.1	197 19.0	106	·23 33.6	+ 37
4	126 31.4	263 13.8	03.4	158 07.9	18.0	4 32.9	29.1	263 30.9	14.2	211 48.6	107	23 29.9	+ 38
5	141 33.9	278 16.8	02.6	173 08.6	17.4	19 35.5	29.2	278 33.1	14.3	226 18.3	107	23 26.1	+ 39
6	156 36.4	293 19.9	−17 01.8	188 09.4	−14 16.7	34 38.1	+20 29.2	293 35.3	−14 14.4	240 48.0	107	−23 22.2	+ 41
7	171 38.8	308 23.0	01.0	203 10.2	16.0	49 40.6	29.2	308 37.4	14.4	255 17.7	107	23 18.1	+ 41
8	186 41.3	323 26.0	17 00.2	218 11.0	15.4	64 43.2	29.2	323 39.6	14.5	269 47.4	107	23 14.0	+ 43
9	201 43.8	338 29.1	·16 59.4	233 11.7	·· 14.7	79 45.7	·· 29.3	338 41.8	·· 14.6	284 17.1	108	·23 09.7	+ 44
10	216 46.2	353 32.1	58.6	248 12.5	14.1	94 48.3	29.3	353 44.0	14.7	298 46.9	108	23 05.3	+ 45
11	231 48.7	8 35.2	57.8	263 13.3	13.4	109 50.9	29.3	8 46.2	14.8	313 16.7	108	23 00.8	+ 46
12	246 51.2	23 38.2	−16 57.0	278 14.1	−14 12.7	124 53.4	+20 29.3	23 48.3	−14 14.8	327 46.5	108	−22 56.2	+ 47
13	261 53.6	38 41.2	56.2	293 14.8	12.1	139 56.0	29.4	38 50.5	14.9	342 16.3	108	22 51.5	+ 48
14	276 56.1	53 44.3	55.4	308 15.6	11.4	154 58.5	29.4	53 52.7	15.0	356 46.1	109	22 46.7	+ 50
15	291 58.5	68 47.3	·· 54.6	323 16.4	·· 10.8	170 01.1	·· 29.4	68 54.9	·· 15.1	11 16.0	109	·22 41.7	+ 50
16	307 01.0	83 50.3	53.8	338 17.2	10.1	185 03.7	29.4	83 57.1	15.2	25 45.9	109	22 36.7	+ 52
17	322 03.5	98 53.3	53.0	353 17.9	09.4	200 06.2	29.5	98 59.2	15.3	40 15.8	109	22 31.5	+ 53
18	337 05.9	113 56.4	−16 52.2	8 18.7	−14 08.8	215 08.8	+20 29.5	114 01.4	−14 15.3	54 45.7	110	−22 26.2	+ 54
19	352 08.4	128 59.4	51.4	23 19.5	08.1	230 11.4	29.5	129 03.6	15.4	69 15.7	110	22 20.8	+ 55
20	7 10.9	144 02.4	50.6	38 20.3	07.4	245 13.9	29.6	144 05.8	15.5	83 45.7	110	22 15.3	+ 56
21	22 13.3	159 05.4	·· 49.9	53 21.0	·· 06.8	260 16.5	·· 29.6	159 08.0	·· 15.6	98 15.7	110	·22 09.7	+ 58
22	37 15.8	174 08.4	49.1	68 21.8	06.1	275 19.0	29.6	174 10.1	15.7	112 45.7	111	22 03.9	+ 58
23	52 18.3	189 11.4	48.3	83 22.6	05.5	290 21.6	29.6	189 12.3	15.7	127 15.8	111	21 58.1	+ 60
29 0	67 20.7	204 14.4	−16 47.5	98 23.4	−14 04.8	305 24.2	+20 29.7	204 14.5	−14 15.8	141 45.9	111	−21 52.1	+ 60
1	82 23.2	219 17.4	46.7	113 24.1	04.1	320 26.7	29.7	219 16.7	15.9	156 16.0	111	21 46.1	+ 62
2	97 25.6	234 20.4	46.0	128 24.9	03.5	335 29.3	29.7	234 18.9	16.0	170 46.1	112	21 39.9	+ 63
3	112 28.1	249 23.3	·· 45.2	143 25.7	·· 02.8	350 31.9	·· 29.8	249 21.0	·· 16.1	185 16.3	112	·21 33.6	+ 64
4	127 30.6	264 26.3	44.4	158 26.5	02.1	5 34.4	29.8	264 23.2	16.2	199 46.5	112	21 27.2	+ 64
5	142 33.0	279 29.3	43.6	173 27.3	01.5	20 37.0	29.8	279 25.4	16.2	214 16.7	113	21 20.8	+ 66
6	157 35.5	294 32.3	−16 42.9	188 28.0	−14 00.8	35 39.6	+20 29.8	294 27.6	−14 16.3	228 47.0	113	−21 14.2	+ 67
7	172 38.0	309 35.2	42.1	203 28.8	14 00.1	50 42.1	29.9	309 29.8	16.4	243 17.3	113	21 07.5	+ 68
8	187 40.4	324 38.2	41.3	218 29.6	13 59.5	65 44.7	29.9	324 31.9	16.5	257 47.6	114	21 00.7	+ 70
9	202 42.9	339 41.1	·· 40.6	233 30.4	·· 58.8	80 47.3	·· 29.9	339 34.1	·· 16.6	272 18.0	113	·20 53.7	+ 70
10	217 45.4	354 44.1	39.8	248 31.1	58.1	95 49.9	29.9	354 36.3	16.6	286 48.3	114	20 46.7	+ 71
11	232 47.8	9 47.0	39.1	263 31.9	57.5	110 52.4	30.0	9 38.5	16.7	301 18.7	115	20 39.6	+ 72
12	247 50.3	24 50.0	−16 38.3	278 32.7	−13 56.8	125 55.0	+20 30.0	24 40.7	−14 16.8	315 49.2	115	−20 32.4	+ 73
13	262 52.8	39 52.9	37.5	293 33.5	56.1	140 57.6	30.0	39 42.8	16.9	330 19.7	115	20 25.1	+ 75
14	277 55.2	54 55.9	36.8	308 34.2	55.5	156 00.1	30.1	54 45.0	17.0	344 50.2	115	20 17.6	+ 75
15	292 57.7	69 58.8	·· 36.0	323 35.0	·· 54.8	171 02.7	·· 30.1	69 47.2	·· 17.0	359 20.7	116	·20 10.1	+ 76
16	308 00.1	85 01.7	35.3	338 35.8	54.2	186 05.3	30.1	84 49.4	17.1	13 51.3	116	20 02.5	+ 78
17	323 02.6	100 04.6	34.5	353 36.6	53.5	201 07.8	30.2	99 51.6	17.2	28 21.9	116	19 54.7	+ 78
18	338 05.1	115 07.6	−16 33.8	8 37.3	−13 52.8	216 10.4	+20 30.2	114 53.8	−14 17.3	42 52.5	117	−19 46.9	+ 79
19	353 07.5	130 10.5	33.0	23 38.1	52.2	231 13.0	30.2	129 55.9	17.4	57 23.2	116	19 39.0	+ 80
20	8 10.0	145 13.4	32.3	38 38.9	51.5	246 15.6	30.2	144 58.1	17.4	71 53.8	118	19 31.0	+ 82
21	23 12.5	160 16.3	·· 31.6	53 39.7	·· 50.8	261 18.1	·· 30.3	160 00.3	·· 17.5	86 24.6	117	·19 22.8	+ 82
22	38 14.9	175 19.2	30.8	68 40.5	50.2	276 20.7	30.3	175 02.5	17.6	100 55.3	118	19 14.6	+ 83
23	53 17.4	190 22.1	30.1	83 41.2	49.5	291 23.3	30.3	190 04.7	17.7	115 26.1	118	19 06.3	+ 84
24	68 19.9	205 25.0	−16 29.3	98 42.0	−13 48.8	306 25.9	+20 30.4	205 06.8	−14 17.8	129 56.9	119	−18 57.9	+ 85
code	−	+ 30	+ 8	+ 7	+ 6	+ 26	+ 1	+ 22	− 1				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
27 0	183 09.1	−20 59.5
1	198 08.9	21 00.0
2	213 08.7	00.4
3	228 08.5	•• 00.9
4	243 08.3	01.4
5	258 08.1	01.8
6	273 07.9	−21 02.3
7	288 07.7	02.8
8	303 07.5	03.2
9	318 07.3	•• 03.7
10	333 07.1	04.2
11	348 06.9	04.6
12	3 06.7	−21 05.1
13	18 06.5	05.5
14	33 06.3	06.0
15	48 06.1	•• 06.5
16	63 05.9	06.9
17	78 05.7	07.4
18	93 05.5	−21 07.8
19	108 05.3	08.3
20	123 05.1	08.7
21	138 04.9	•• 09.2
22	153 04.7	09.7
23	168 04.5	10.1
28 0	183 04.2	−21 10.6
1	198 04.0	11.0
2	213 03.8	11.5
3	228 03.6	•• 11.9
4	243 03.4	12.4
5	258 03.2	12.8
6	273 03.0	−21 13.3
7	288 02.8	13.7
8	303 02.6	14.2
9	318 02.4	•• 14.6
10	333 02.2	15.1
11	348 01.9	15.5
12	3 01.7	−21 15.9
13	18 01.5	16.4
14	33 01.3	16.8
15	48 01.1	•• 17.3
16	63 00.9	17.7
17	78 00.7	18.2
18	93 00.5	−21 18.6
19	108 00.2	19.0
20	123 00.0	19.5
21	137 59.8	•• 19.9
22	152 59.6	20.4
23	167 59.4	20.8
29 0	182 59.2	−21 21.2
1	197 59.0	21.7
2	212 58.7	22.1
3	227 58.5	•• 22.5
4	242 58.3	23.0
5	257 58.1	23.4
6	272 57.9	−21 23.8
7	287 57.7	24.3
8	302 57.4	24.7
9	317 57.2	•• 25.1
10	332 57.0	25.6
11	347 56.8	26.0
12	2 56.6	−21 26.4
13	17 56.3	26.8
14	32 56.1	27.3
15	47 55.9	•• 27.7
16	62 55.7	28.1
17	77 55.5	28.5
18	92 55.3	−21 29.0
19	107 55.0	29.4
20	122 54.8	29.8
21	137 54.6	•• 30.2
22	152 54.4	30.7
23	167 54.1	31.1
24	182 53.9	−21 31.5
code	—	− 5

No.	STARS Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.1	−40 29.0
5	Achernar	335 58.8	−57 28.0
30	Acrux	173 58.9	−62 50.8
19	Adhara	255 46.7	−28 54.4
10	Aldebaran	291 39.4	+16 25.3
32	Alioth	166 59.4	+56 12.0
34	Alkaid	153 33.7	+49 32.0
55	Al Na'ir	28 38.7	−47 10.9
15	Alnilam	276 30.6	− 1 13.7
25	Alphard	218 39.1	− 8 27.7
41	Alphecca	126 48.5	+26 51.9
1	Alpheratz	358 28.8	+28 50.8
51	Altair	62 51.3	+ 8 45.0
2	Ankaa	353 58.6	−42 33.1
42	Antares	113 20.5	−26 20.0
37	Arcturus	146 36.0	+19 24.9
43	Atria	109 02.4	−68 56.9
22	Avior	234 35.7	−59 21.6
13	Bellatrix	279 18.8	+ 6 18.7
16	Betelg'se	271 48.5	+ 7 24.1
17	Canopus	264 15.2	−52 40.0
12	Capella	281 38.9	+45 57.3
53	Deneb	50 01.7	+45 07.4
28	Denebola	183 18.5	+14 49.3
4	Diphda	349 39.7	−18 14.0
27	Dubhe	194 45.4	+61 59.3
14	Elnath	279 07.7	+28 34.3
47	Eltanin	91 07.0	+51 29.7
54	Enif	34 30.3	+ 9 40.2
56	Fomalhaut	16 12.2	−29 51.7
31	Gacrux	172 50.3	−56 51.5
29	Gienah	176 37.7	−17 17.5
35	Hadar	149 50.9	−60 09.3
6	Hamal	328 50.1	+23 15.2
48	Kaus Aust.	84 42.4	−34 24.5
40	Kochab	137 18.9	+74 20.2
57	Markab	14 22.0	+14 58.0
8	Menkar	315 00.7	+ 3 55.0
36	Menkent	148 59.8	−36 08.9
24	Miapl'dus	221 48.9	−69 31.6
9	Mirfak	309 42.8	+49 42.3
50	Nunki	76 53.0	−26 21.3
52	Peacock	54 28.5	−56 53.0
21	Pollux	244 21.1	+28 08.1
20	Procyon	245 45.4	+ 5 20.5
46	R'alhague	96 47.5	+12 35.5
26	Regulus	208 30.1	+12 11.2
11	Rigel	281 53.9	− 8 15.0
38	Rigil Kent.	140 52.5	−60 39.0
44	Sabik	103 03.2	−15 40.2
3	Schedar	350 30.4	+56 17.8
45	Shaula	97 21.9	−37 04.4
18	Sirius	259 12.1	−16 39.1
33	Spica	159 17.8	−10 55.6
23	Suhail	223 24.6	−43 14.8
49	Vega	81 09.1	+38 44.6
39	Zub'g'bi	137 54.4	−15 51.3

Lat.	Sunrise	Twlt. begins	Moonrise 27	Moonrise 28	Moonrise 29	Moonrise 30
N °	h m	h m	h m	h m	h m	h m
72	■	6 14	■	■	■	14 24
70	■	6 08	■	■	■	13 35
68	10 17	6 03	■	■	13 30	13 04
66	9 35	5 59	■	12 59	12 48	12 40
64	9 06	5 55	11 52	12 12	12 19	12 22
62	8 45	5 52	11 12	11 41	11 57	12 07
60	8 28	5 49	10 45	11 18	11 40	11 54
58	8 13	5 45	10 23	10 59	11 25	11 43
56	8 01	5 43	10 06	10 44	11 12	11 33
54	7 50	5 40	9 51	10 30	11 01	11 24
52	7 41	5 37	9 38	10 18	10 51	11 17
50	7 32	5 35	9 26	10 08	10 42	11 10
45	7 14	5 29	9 02	9 46	10 23	10 55
40	6 59	5 22	8 43	9 28	10 08	10 42
35	6 46	5 17	8 28	9 14	9 55	10 32
30	6 36	5 11	8 14	9 01	9 43	10 23
20	6 16	4 59	7 50	8 38	9 24	10 07
10	6 00	4 45	7 30	8 19	9 07	9 53
0	5 44	4 30	7 11	8 01	8 51	9 39
10	5 28	4 12	6 52	7 43	8 35	9 26
20	5 11	3 49	6 32	7 24	8 18	9 12
30	4 52	3 19	6 08	7 02	7 58	8 56
35	4 40	2 57	5 54	6 49	7 47	8 46
40	4 27	2 31	5 38	6 34	7 33	8 35
45	4 11	1 52	5 19	6 16	7 17	8 23
50	3 51	0 37	4 56	5 53	6 58	8 07
52	3 42	////	4 44	5 43	6 49	8 00
54	3 31	////	4 31	5 30	6 38	7 51
56	3 19	////	4 16	5 17	6 26	7 42
58	3 05	////	3 59	5 00	6 13	7 32
60	2 49	////	3 37	4 40	5 57	7 20
S						

Lat.	Sunset	Twlt. ends	Moonset 27	Moonset 28	Moonset 29	Moonset 30
N °	h m	h m	h m	h m	h m	h m
72	■	17 18	■	■	■	17 36
70	■	17 25	■	■	■	18 23
68	13 19	17 30	■	■	16 48	18 54
66	14 01	17 34	■	15 35	17 29	19 16
64	14 29	17 38	14 57	16 22	17 57	19 34
62	14 50	17 41	15 37	16 52	18 18	19 48
60	15 08	17 45	16 04	17 15	18 35	20 00
58	15 22	17 48	16 25	17 33	18 50	20 10
56	15 34	17 51	16 43	17 48	19 02	20 19
54	15 45	17 54	16 58	18 02	19 13	20 27
52	15 55	17 57	17 10	18 13	19 22	20 34
50	16 03	17 59	17 22	18 23	19 30	20 41
45	16 22	18 06	17 45	18 45	19 48	20 54
40	16 36	18 12	18 04	19 02	20 03	21 06
35	16 49	18 18	18 20	19 16	20 15	21 15
30	17 00	18 24	18 34	19 29	20 26	21 24
20	17 19	18 37	18 57	19 50	20 44	21 38
10	17 36	18 50	19 17	20 08	21 00	21 51
0	17 52	19 06	19 35	20 25	21 14	22 02
10	18 07	19 23	19 54	20 43	21 29	22 14
20	18 24	19 46	20 14	21 01	21 45	22 26
30	18 44	20 18	20 37	21 22	22 02	22 40
35	18 56	20 39	20 50	21 34	22 13	22 48
40	19 09	21 06	21 05	21 48	22 24	22 57
45	19 25	21 45	21 24	22 04	22 38	23 07
50	19 45	23 04	21 47	22 24	22 55	23 20
52	19 54	////	21 58	22 34	23 03	23 26
54	20 05	////	22 10	22 45	23 12	23 32
56	20 17	////	22 24	22 57	23 21	23 40
58	20 31	////	22 41	23 11	23 32	23 48
60	20 48	////	23 01	23 28	23 45	23 57
S						

GMT	Equation of Time (App.—Mean) 27	28	29
h	m s	m s	m s
0	+12 37.0	+12 17.4	+11 57.1
6	+12 32.2	+12 12.4	+11 51.9
12	+12 27.3	+12 07.4	+11 46.7
18	+12 22.4	+12 02.3	+11 41.4
24	+12 17.4	+11 57.1	+11 36.1

DAY	GMT of Transit Meridian of Greenwich: Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
27	13 23	10 31	17 28	3 46	10 29
28	14 13	10 26	17 27	3 42	10 25
29	15 03	10 21	17 26	3 38	10 22
30	15 51	10 16	17 24	3 34	10 18

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.5	0.5	0.1
30	0.5	0.4	0.1
45	0.5	0.3	0.1
60	0.5	0.2	0.0
75	0.5	0.1	0.0
90			

Moon's Lower Limb
Add

Alt.	27	28	29
°	′	′	′
0	12.4	12.8	13.3
4	12.4	12.8	13.3
8	12.4	12.8	13.3
12	12.4	12.8	13.3
16	12.5	12.9	13.3
20	12.6	12.9	13.4
24	12.6	13.0	13.4
28	12.7	13.0	13.5
32	12.8	13.1	13.6
36	12.9	13.2	13.6
40	13.0	13.3	13.7
44	13.1	13.4	13.8
48	13.3	13.5	13.9
52	13.4	13.7	14.0
56	13.5	13.8	14.1
60	13.7	13.9	14.2
64	13.9	14.1	14.3
68	14.0	14.2	14.4
72	14.2	14.3	14.6
76	14.4	14.5	14.7
80	14.5	14.6	14.8
84	14.7	14.8	14.9
88	14.8	14.9	15.0
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	27	28	29
°	′	′	′
0	17.4	17.2	16.9
4	17.4	17.1	16.8
8	17.3	17.1	16.8
12	17.3	17.1	16.8
16	17.2	17.0	16.8
20	17.2	17.0	16.7
24	17.1	16.9	16.7
28	17.0	16.9	16.6
32	16.9	16.8	16.6
36	16.8	16.7	16.5
40	16.7	16.6	16.4
44	16.6	16.5	16.3
48	16.5	16.4	16.2
52	16.3	16.2	16.1
56	16.2	16.1	16.0
60	16.0	16.0	15.9
64	15.9	15.8	15.8
68	15.7	15.7	15.7
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.2	15.3	15.3
84	15.0	15.1	15.2
88	14.9	15.0	15.1
90			

Subtract from table, back cover

First Sunday in Advent 28

GMT	♈ GHA	VENUS −4.0 GHA	VENUS Dec.	MARS 0.5 GHA	MARS Dec.	JUPITER −2.1 GHA	JUPITER Dec.	SATURN 0.8 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
30 0	68 19.9	205 25.0	−16 29.3	98 42.0	−13 48.8	306 25.9	+20 30.4	205 06.8	−14 17.8	129 56.9	119	−18 57.9	+ 85
1	83 22.3	220 27.9	28.6	113 42.8	48.1	321 28.4	30.4	220 09.0	17.8	144 27.8	119	18 49.4	+ 87
2	98 24.8	235 30.8	27.9	128 43.6	47.5	336 31.0	30.4	235 11.2	17.9	158 58.7	119	18 40.7	+ 87
3	113 27.3	250 33.7	•• 27.1	143 44.3	•• 46.8	351 33.6	•• 30.4	250 13.4	•• 18.0	173 29.6	119	·18 32.0	+ 87
4	128 29.7	265 36.6	26.4	158 45.1	46.1	6 36.2	30.5	265 15.6	18.1	188 00.5	120	18 23.3	+ 89
5	143 32.2	280 39.4	25.7	173 45.9	45.5	21 38.7	30.5	280 17.7	18.2	202 31.5	120	18 14.4	+ 90
6	158 34.6	295 42.3	−16 24.9	188 46.7	−13 44.8	36 41.3	+20 30.5	295 19.9	−14 18.3	217 02.5	121	−18 05.4	+ 91
7	173 37.1	310 45.2	24.2	203 47.4	44.1	51 43.9	30.6	310 22.1	18.3	231 33.6	120	17 56.3	+ 91
8	188 39.6	325 48.0	23.5	218 48.2	43.5	66 46.5	30.6	325 24.3	18.4	246 04.6	121	17 47.2	+ 93
9	203 42.0	340 50.9	•• 22.8	233 49.0	•• 42.8	81 49.0	•• 30.6	340 26.5	•• 18.5	260 35.7	122	·17 37.9	+ 93
10	218 44.5	355 53.7	22.1	248 49.8	42.1	96 51.6	30.7	355 28.7	18.6	275 06.9	121	17 28.6	+ 95
11	233 47.0	10 56.6	21.3	263 50.6	41.5	111 54.2	30.7	10 30.8	18.7	289 38.0	122	17 19.1	+ 95
12	248 49.4	25 59.4	−16 20.6	278 51.3	−13 40.8	126 56.8	+20 30.7	25 33.0	−14 18.7	304 09.2	122	−17 09.6	+ 96
13	263 51.9	41 02.3	19.9	293 52.1	40.1	141 59.3	30.7	40 35.2	18.8	318 40.4	123	17 00.0	+ 97
14	278 54.4	56 05.1	19.2	308 52.9	39.4	157 01.9	30.8	55 37.4	18.9	333 11.7	123	16 50.3	+ 98
15	293 56.8	71 08.0	•• 18.5	323 53.7	•• 38.8	172 04.5	•• 30.8	70 39.6	•• 19.0	347 43.0	123	·16 40.5	+ 98
16	308 59.3	86 10.8	17.8	338 54.4	38.1	187 07.1	30.8	85 41.7	19.1	2 14.3	123	16 30.7	+100
17	324 01.8	101 13.6	17.1	353 55.2	37.4	202 09.7	30.9	100 43.9	19.1	16 45.6	124	16 20.7	+100
18	339 04.2	116 16.4	−16 16.4	8 56.0	−13 36.8	217 12.2	+20 30.9	115 46.1	−14 19.2	31 17.0	124	−16 10.7	+101
19	354 06.7	131 19.3	15.7	23 56.8	36.1	232 14.8	30.9	130 48.3	19.3	45 48.4	124	16 00.6	+102
20	9 09.1	146 22.1	15.0	38 57.6	35.4	247 17.4	31.0	145 50.5	19.4	60 19.8	125	15 50.4	+103
21	24 11.6	161 24.9	•• 14.3	53 58.3	•• 34.7	262 20.0	•• 31.0	160 52.7	•• 19.5	74 51.3	124	·15 40.1	+104
22	39 14.1	176 27.7	13.6	68 59.1	34.1	277 22.6	31.0	175 54.8	19.5	89 22.7	125	15 29.7	+104
23	54 16.5	191 30.5	12.9	83 59.9	33.4	292 25.1	31.1	190 57.0	19.6	103 54.2	126	15 19.3	+105
1 0	69 19.0	206 33.3	−16 12.2	99 00.7	−13 32.7	307 27.7	+20 31.1	205 59.2	−14 19.7	118 25.8	125	−15 08.8	+106
1	84 21.5	221 36.1	11.5	114 01.5	32.1	322 30.3	31.1	221 01.4	19.8	132 57.3	126	14 58.2	+107
2	99 23.9	236 38.9	10.8	129 02.2	31.4	337 32.9	31.1	236 03.6	19.9	147 28.9	126	14 47.5	+108
3	114 26.4	251 41.7	•• 10.1	144 03.0	•• 30.7	352 35.5	•• 31.2	251 05.8	•• 19.9	162 00.5	126	·14 36.7	+108
4	129 28.9	266 44.4	09.4	159 03.8	30.0	7 38.1	31.2	266 07.9	20.0	176 32.1	127	14 25.9	+109
5	144 31.3	281 47.2	08.7	174 04.6	29.4	22 40.6	31.2	281 10.1	20.1	191 03.8	126	14 15.0	+110
6	159 33.8	296 50.0	−16 08.1	189 05.3	−13 28.7	37 43.2	+20 31.3	296 12.3	−14 20.2	205 35.4	127	−14 04.0	+111
7	174 36.2	311 52.8	07.4	204 06.1	28.0	52 45.8	31.3	311 14.5	20.3	220 07.1	128	13 52.9	+111
8	189 38.7	326 55.5	06.7	219 06.9	27.4	67 48.4	31.3	326 16.7	20.3	234 38.9	127	13 41.8	+112
9	204 41.2	341 58.3	•• 06.0	234 07.7	•• 26.7	82 51.0	•• 31.4	341 18.9	•• 20.4	249 10.6	127	·13 30.6	+113
10	219 43.6	357 01.1	05.4	249 08.5	26.0	97 53.6	31.4	356 21.0	20.5	263 42.3	128	13 19.3	+114
11	234 46.1	12 03.8	04.7	264 09.2	25.3	112 56.2	31.4	11 23.2	20.6	278 14.1	128	13 07.9	+114
12	249 48.6	27 06.6	−16 04.0	279 10.0	−13 24.7	127 58.7	+20 31.5	26 25.4	−14 20.7	292 45.9	128	−12 56.5	+115
13	264 51.0	42 09.3	03.3	294 10.8	24.0	143 01.3	31.5	41 27.6	20.7	307 17.7	129	12 45.0	+115
14	279 53.5	57 12.0	02.7	309 11.6	23.3	158 03.9	31.5	56 29.8	20.8	321 49.6	128	12 33.5	+117
15	294 56.0	72 14.8	•• 02.0	324 12.4	•• 22.6	173 06.5	•• 31.6	71 32.0	•• 20.9	336 21.4	129	·12 21.8	+117
16	309 58.4	87 17.5	01.3	339 13.1	22.0	188 09.1	31.6	86 34.1	21.0	350 53.3	129	12 10.1	+117
17	325 00.9	102 20.2	00.7	354 13.9	21.3	203 11.7	31.6	101 36.3	21.1	5 25.2	129	11 58.4	+119
18	340 03.4	117 23.0	−16 00.0	9 14.7	−13 20.6	218 14.3	+20 31.7	116 38.5	−14 21.1	19 57.1	129	−11 46.5	+119
19	355 05.8	132 25.7	15 59.4	24 15.5	19.9	233 16.9	31.7	131 40.7	21.2	34 29.0	129	11 34.6	+119
20	10 08.3	147 28.4	58.7	39 16.3	19.3	248 19.4	31.7	146 42.9	21.3	49 00.9	130	11 22.7	+121
21	25 10.7	162 31.1	•• 58.1	54 17.0	•• 18.6	263 22.0	•• 31.8	161 45.1	•• 21.4	63 32.9	129	·11 10.6	+121
22	40 13.2	177 33.8	57.4	69 17.8	17.9	278 24.6	31.8	176 47.2	21.5	78 04.8	130	10 58.5	+121
23	55 15.7	192 36.5	56.8	84 18.6	17.2	293 27.2	31.8	191 49.4	21.5	92 36.8	130	10 46.4	+122
2 0	70 18.1	207 39.2	−15 56.1	99 19.4	−13 16.5	308 29.8	+20 31.9	206 51.6	−14 21.6	107 08.8	130	−10 34.2	+123
1	85 20.6	222 41.9	55.5	114 20.2	15.9	323 32.4	31.9	221 53.8	21.7	121 40.8	130	10 21.9	+124
2	100 23.1	237 44.6	54.8	129 20.9	15.2	338 35.0	31.9	236 56.0	21.8	136 12.8	130	10 09.5	+124
3	115 25.5	252 47.3	•• 54.2	144 21.7	•• 14.5	353 37.6	•• 32.0	251 58.2	•• 21.9	150 44.8	130	· 9 57.1	+124
4	130 28.0	267 50.0	53.5	159 22.5	13.8	8 40.2	32.0	267 00.3	21.9	165 16.8	130	9 44.7	+125
5	145 30.5	282 52.7	52.9	174 23.3	13.2	23 42.8	32.0	282 02.5	22.0	179 48.8	130	9 32.2	+126
6	160 32.9	297 55.4	−15 52.3	189 24.1	−13 12.5	38 45.4	+20 32.1	297 04.7	−14 22.1	194 20.8	131	− 9 19.6	+126
7	175 35.4	312 58.0	51.6	204 24.8	11.8	53 47.9	32.1	312 06.9	22.2	208 52.9	130	9 07.0	+127
8	190 37.9	328 00.7	51.0	219 25.6	11.1	68 50.5	32.1	327 09.1	22.2	223 24.9	130	8 54.3	+128
9	205 40.3	343 03.4	•• 50.4	234 26.4	•• 10.5	83 53.1	•• 32.2	342 11.3	•• 22.3	237 56.9	131	· 8 41.5	+127
10	220 42.8	358 06.0	49.7	249 27.2	09.8	98 55.7	32.2	357 13.4	22.4	252 29.0	130	8 28.8	+129
11	235 45.2	13 08.7	49.1	264 28.0	09.1	113 58.3	32.2	12 15.6	22.5	267 01.0	131	8 15.9	+129
12	250 47.7	28 11.3	−15 48.5	279 28.8	−13 08.4	129 00.9	+20 32.3	27 17.8	−14 22.6	281 33.1	130	− 8 03.0	+129
13	265 50.2	43 14.0	47.9	294 29.5	07.7	144 03.5	32.3	42 20.0	22.6	296 05.1	131	7 50.1	+130
14	280 52.6	58 16.6	47.2	309 30.3	07.1	159 06.1	32.3	57 22.2	22.7	310 37.2	130	7 37.1	+131
15	295 55.1	73 19.3	•• 46.6	324 31.1	•• 06.4	174 08.7	•• 32.4	72 24.4	•• 22.8	325 09.2	130	· 7 24.0	+131
16	310 57.6	88 21.9	46.0	339 31.9	05.7	189 11.3	32.4	87 26.5	22.9	339 41.2	131	7 10.9	+131
17	326 00.0	103 24.5	45.4	354 32.7	05.0	204 13.9	32.4	102 28.7	23.0	354 13.3	130	6 57.8	+132
18	341 02.5	118 27.1	−15 44.8	9 33.4	−13 04.3	219 16.5	+20 32.5	117 30.9	−14 23.0	8 45.3	130	− 6 44.6	+133
19	356 05.0	133 29.8	44.2	24 34.2	03.7	234 19.1	32.5	132 33.1	23.1	23 17.3	131	6 31.3	+132
20	11 07.4	148 32.4	43.6	39 35.0	03.0	249 21.7	32.5	147 35.3	23.2	37 49.4	130	6 18.1	+134
21	26 09.9	163 35.0	•• 43.0	54 35.8	•• 02.3	264 24.3	•• 32.6	162 37.5	•• 23.3	52 21.4	130	· 6 04.7	+133
22	41 12.3	178 37.6	42.3	69 36.6	01.6	279 26.9	32.6	177 39.7	23.4	66 53.4	130	5 51.4	+134
23	56 14.8	193 40.2	41.7	84 37.4	00.9	294 29.5	32.6	192 41.8	23.4	81 25.4	129	5 38.0	+135
24	71 17.3	208 42.8	−15 41.1	99 38.1	−13 00.3	309 32.1	+20 32.7	207 44.0	−14 23.5	95 57.3	130	− 5 24.5	+135
code	—	+ 27	+ 7	+ 8	+ 7	+ 26	0	+ 22	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
30 0	182 53.9	−21 31.5
1	197 53.7	31.9
2	212 53.5	32.3
3	227 53.3 ••	32.7
4	242 53.0	33.2
5	257 52.8	33.6
6	272 52.6	−21 34.0
7	287 52.4	34.4
8	302 52.1	34.8
9	317 51.9 ••	35.2
10	332 51.7	35.6
11	347 51.5	36.1
12	2 51.2	−21 36.5
13	17 51.0	36.9
14	32 50.8	37.3
15	47 50.6 ••	37.7
16	62 50.3	38.1
17	77 50.1	38.5
18	92 49.9	−21 38.9
19	107 49.7	39.3
20	122 49.4	39.7
21	137 49.2 ••	40.1
22	152 49.0	40.5
23	167 48.7	40.9
1 0	182 48.5	−21 41.3
1	197 48.3	41.7
2	212 48.0	42.1
3	227 47.8 ••	42.5
4	242 47.6	42.9
5	257 47.4	43.3
6	272 47.1	−21 43.7
7	287 46.9	44.1
8	302 46.7	44.5
9	317 46.4 ••	44.9
10	332 46.2	45.3
11	347 46.0	45.7
12	2 45.7	−21 46.1
13	17 45.5	46.5
14	32 45.3	46.9
15	47 45.0 ••	47.3
16	62 44.8	47.7
17	77 44.6	48.1
18	92 44.3	−21 48.5
19	107 44.1	48.8
20	122 43.9	49.2
21	137 43.6 ••	49.6
22	152 43.4	50.0
23	167 43.2	50.4
2 0	182 42.9	−21 50.8
1	197 42.7	51.2
2	212 42.5	51.5
3	227 42.2 ••	51.9
4	242 42.0	52.3
5	257 41.7	52.7
6	272 41.5	−21 53.1
7	287 41.3	53.5
8	302 41.0	53.8
9	317 40.8 ••	54.2
10	332 40.6	54.6
11	347 40.3	55.0
12	2 40.1	−21 55.3
13	17 39.8	55.7
14	32 39.6	56.1
15	47 39.4 ••	56.5
16	62 39.1	56.8
17	77 38.9	57.2
18	92 38.6	−21 57.6
19	107 38.4	58.0
20	122 38.2	58.3
21	137 37.9 ••	58.7
22	152 37.7	59.1
23	167 37.4	59.4
24	182 37.2	−21 59.8
code	—	− 4

No.	STARS Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.1	−40 29.0
5	Achernar	335 58.8	−57 28.0
30	Acrux	173 58.9	−62 50.8
19	Adhara	255 46.7	−28 54.4
10	Aldebaran	291 39.4	+16 25.3
32	Alioth	166 59.3	+56 11.9
34	Alkaid	153 33.7	+49 32.0
55	Al Na'ir	28 38.8	−47 10.9
15	Alnilam	276 30.6	− 1 13.7
25	Alphard	218 39.1	− 8 27.7
41	Alphecca	126 48.5	+26 51.8
1	Alpheratz	358 28.8	+28 50.8
51	Altair	62 51.3	+ 8 45.0
2	Ankaa	353 58.6	−42 33.1
42	Antares	113 20.5	−26 20.0
37	Arcturus	146 36.0	+19 24.9
43	Atria	109 02.4	−68 56.9
22	Avior	234 35.7	−59 21.6
13	Bellatrix	279 18.7	+ 6 18.7
16	Betelg'se	271 48.5	+ 7 24.1
17	Canopus	264 15.1	−52 40.1
12	Capella	281 38.9	+45 57.3
53	Deneb	50 01.7	+45 07.4
28	Denebola	183 18.4	+14 49.3
4	Diphda	349 39.7	−18 14.0
27	Dubhe	194 45.3	+61 59.3
14	Elnath	279 07.7	+28 34.3
47	Eltanin	91 07.0	+51 29.7
54	Enif	34 30.3	+ 9 40.2
56	Fomalhaut	16 12.3	−29 51.7
31	Gacrux	172 50.3	−56 51.5
29	Gienah	176 37.6	−17 17.5
35	Hadar	149 50.9	−60 09.3
6	Hamal	328 50.1	+23 15.2
48	Kaus Aust.	84 42.4	−34 24.5
40	Kochab	137 18.9	+74 20.2
57	Markab	14 22.0	+14 58.0
8	Menkar	315 00.6	+ 3 55.0
36	Menkent	148 59.7	−36 08.9
24	Miapl'dus	221 48.9	−69 31.6
9	Mirfak	309 42.8	+49 42.3
50	Nunki	76 53.0	−26 21.3
52	Peacock	54 28.6	−56 53.0
21	Pollux	244 21.0	+28 08.1
20	Procyon	245 45.4	+ 5 20.5
46	R'alhague	96 47.5	+12 35.5
26	Regulus	208 30.1	+12 11.2
11	Rigel	281 53.9	− 8 15.0
38	Rigil Kent.	140 52.5	−60 39.0
44	Sabik	103 03.2	−15 40.2
3	Schedar	350 30.4	+56 17.8
45	Shaula	97 21.9	−37 04.4
18	Sirius	259 12.1	−16 39.1
33	Spica	159 17.8	−10 55.6
23	Suhail	223 24.6	−43 14.8
49	Vega	81 09.1	+38 44.6
39	Zub'g'bi	137 54.4	−15 51.3

Lat.	Sunrise	Twlt. begins	Moonrise 30	Moonrise 1	Moonrise 2	Moonrise 3
N °	h m	h m	h m	h m	h m	h m
72	■	6 22	14 24	13 29	12 58	12 33
70	■	6 15	13 35	13 06	12 46	12 29
68	10 34	6 10	13 04	12 49	12 37	12 26
66	9 45	6 05	12 40	12 35	12 29	12 24
64	9 15	6 01	12 22	12 23	12 23	12 22
62	8 52	5 57	12 07	12 13	12 17	12 20
60	8 34	5 53	11 54	12 04	12 12	12 18
58	8 19	5 50	11 43	11 56	12 07	12 17
56	8 06	5 46	11 33	11 50	12 03	12 16
54	7 55	5 43	11 24	11 43	12 00	12 15
52	7 45	5 41	11 17	11 38	11 56	12 13
50	7 36	5 38	11 10	11 33	11 53	12 13
45	7 17	5 31	10 55	11 22	11 47	12 10
40	7 02	5 25	10 42	11 13	11 41	12 09
35	6 49	5 19	10 32	11 05	11 37	12 07
30	6 38	5 13	10 23	10 59	11 32	12 06
20	6 18	5 00	10 07	10 47	11 25	12 03
10	6 01	4 46	9 53	10 36	11 19	12 01
0	5 45	4 31	9 39	10 26	11 13	11 59
10	5 29	4 12	9 26	10 17	11 07	11 57
20	5 12	3 48	9 12	10 06	11 00	11 55
30	4 51	3 17	8 56	9 54	10 53	11 53
35	4 39	2 55	8 46	9 47	10 49	11 52
40	4 26	2 28	8 35	9 39	10 44	11 50
45	4 09	1 48	8 23	9 30	10 38	11 48
50	3 49	0 18	8 07	9 18	10 32	11 46
52	3 39	////	8 00	9 13	10 28	11 45
54	3 28	////	7 51	9 07	10 25	11 44
56	3 16	////	7 42	9 01	10 21	11 43
58	3 01	////	7 32	8 54	10 17	11 42
60	2 44	////	7 20	8 45	10 12	11 40
S						

Lat.	Sunset	Twlt. ends	Moonset 30	Moonset 1	Moonset 2	Moonset 3
N °	h m	h m	h m	h m	h m	h m
72	■	17 13	17 36	20 10	22 19	24 23
70	■	17 20	18 23	20 30	22 27	24 23
68	13 04	17 26	18 54	20 46	22 35	24 23
66	13 52	17 30	19 16	20 59	22 41	24 23
64	14 22	17 35	19 34	21 10	22 46	24 23
62	14 45	17 39	19 48	21 19	22 50	24 23
60	15 03	17 42	20 00	21 26	22 54	24 23
58	15 18	17 46	20 10	21 33	22 57	24 23
56	15 31	17 49	20 19	21 39	23 00	24 22
54	15 43	17 53	20 27	21 44	23 02	24 22
52	15 53	17 56	20 34	21 49	23 05	24 22
50	16 01	17 58	20 41	21 53	23 07	24 22
45	16 20	18 05	20 54	22 02	23 12	24 22
40	16 35	18 11	21 06	22 10	23 15	24 22
35	16 49	18 18	21 15	22 17	23 19	24 22
30	17 00	18 24	21 24	22 22	23 22	24 22
20	17 19	18 37	21 38	22 32	23 27	24 22
10	17 36	18 51	21 51	22 41	23 31	24 22
0	17 53	19 07	22 02	22 49	23 35	24 22
10	18 09	19 26	22 14	22 57	23 39	24 21
20	18 26	19 49	22 26	23 05	23 43	24 21
30	18 47	20 21	22 40	23 15	23 48	24 21
35	18 59	20 43	22 48	23 20	23 51	24 21
40	19 13	21 11	22 57	23 26	23 54	24 21
45	19 29	21 52	23 07	23 33	23 57	24 20
50	19 49	23 28	23 20	23 42	24 01	0 01
52	19 59	////	23 26	23 46	24 03	0 03
54	20 10	////	23 32	23 50	24 05	0 05
56	20 23	////	23 40	23 55	24 08	0 08
58	20 37	////	23 48	24 00	0 00	0 10
60	20 55	////	23 57	24 06	0 06	0 13
S						

GMT	Equation of Time (App.—Mean) 30	1	2
h	m s	m s	m s
0	+11 36.1	+11 14.5	+10 52.2
6	+11 30.8	+11 09.0	+10 46.5
12	+11 25.4	+11 03.4	+10 40.8
18	+11 20.0	+10 57.8	+10 35.1
24	+11 14.5	+10 52.2	+10 29.3

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
30	15 51	10 16	17 24	3 34	10 18
1	16 38	10 12	17 23	3 30	10 15
2	17 24	10 08	17 22	3 25	10 11
3	18 10	10 03	17 21	3 21	10 08

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.5	0.5	0.1
30			
	0.5	0.4	0.1
45			
	0.5	0.3	0.1
60			
	0.5	0.2	0.0
75			
	0.5	0.1	0.0
90			

Moon's Lower Limb **Add**

Alt.	30	1	2
°	′	′	′
0			
	13.9	14.8	15.7
4			
	13.9	14.8	15.7
8			
	13.9	14.8	15.7
12			
	13.9	14.8	15.7
16			
	14.0	14.8	15.7
20			
	14.0	14.8	15.7
24			
	14.0	14.8	15.7
28			
	14.1	14.9	15.7
32			
	14.1	14.9	15.7
36			
	14.2	14.9	15.7
40			
	14.2	14.9	15.7
44			
	14.3	15.0	15.6
48			
	14.4	15.0	15.6
52			
	14.4	15.0	15.6
56			
	14.5	15.1	15.6
60			
	14.6	15.1	15.6
64			
	14.7	15.1	15.6
68			
	14.8	15.2	15.6
72			
	14.8	15.2	15.6
76			
	14.9	15.3	15.6
80			
	15.0	15.3	15.6
84			
	15.1	15.3	15.6
88			
	15.2	15.4	15.6
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	30	1	2
°	′	′	′
0			
	16.5	16.0	15.5
4			
	16.5	16.0	15.5
8			
	16.5	16.0	15.5
12			
	16.5	16.0	15.5
16			
	16.4	16.0	15.5
20			
	16.4	15.9	15.5
24			
	16.4	15.9	15.5
28			
	16.3	15.9	15.5
32			
	16.3	15.9	15.5
36			
	16.2	15.9	15.5
40			
	16.2	15.8	15.5
44			
	16.1	15.8	15.5
48			
	16.0	15.8	15.5
52			
	16.0	15.7	15.5
56			
	15.9	15.7	15.5
60			
	15.8	15.7	15.5
64			
	15.7	15.6	15.5
68			
	15.6	15.6	15.5
72			
	15.6	15.6	15.6
76			
	15.5	15.5	15.6
80			
	15.4	15.5	15.6
84			
	15.3	15.4	15.6
88			
	15.2	15.4	15.6
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −4.1 GHA	VENUS Dec.	MARS 0.5 GHA	MARS Dec.	JUPITER −2.1 GHA	JUPITER Dec.	SATURN 0.8 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
3 0	71 17.3	208 42.8	−15 41.1	99 38.1	−13 00.3	309 32.1	+20 32.7	207 44.0	−14 23.5	95 57.3	130	− 5 24.5	+135
1	86 19.7	223 45.4	40.5	114 38.9	12 59.6	324 34.7	32.7	222 46.2	23.6	110 29.3	130	5 11.0	+135
2	101 22.2	238 48.0	39.9	129 39.7	58.9	339 37.3	32.7	237 48.4	23.7	125 01.3	129	4 57.5	+136
3	116 24.7	253 50.6	·· 39.3	144 40.5	·· 58.2	354 39.9	·· 32.8	252 50.6	·· 23.7	139 33.2	129	· 4 43.9	+136
4	131 27.1	268 53.2	38.8	159 41.3	57.5	9 42.5	32.8	267 52.8	23.8	154 05.1	129	4 30.3	+136
5	146 29.6	283 55.8	38.2	174 42.0	56.9	24 45.1	32.8	282 54.9	23.9	168 37.0	129	4 16.7	+137
6	161 32.1	298 58.4	−15 37.6	189 42.8	−12 56.2	39 47.7	+20 32.9	297 57.1	−14 24.0	183 08.9	129	− 4 03.0	+137
7	176 34.5	314 00.9	37.0	204 43.6	55.5	54 50.3	32.9	312 59.3	24.1	197 40.8	129	3 49.3	+138
8	191 37.0	329 03.5	36.4	219 44.4	54.8	69 52.9	32.9	328 01.5	24.1	212 12.7	128	3 35.5	+138
9	206 39.5	344 06.1	·· 35.8	234 45.2	·· 54.1	84 55.5	·· 33.0	343 03.7	·· 24.2	226 44.5	128	· 3 21.7	+138
10	221 41.9	359 08.6	35.2	249 46.0	53.4	99 58.1	33.0	358 05.9	24.3	241 16.3	128	3 07.9	+139
11	236 44.4	14 11.2	34.7	264 46.7	52.8	115 00.7	33.0	13 08.1	24.4	255 48.1	128	2 54.0	+138
12	251 46.8	29 13.7	−15 34.1	279 47.5	−12 52.1	130 03.3	+20 33.1	28 10.2	−14 24.5	270 19.9	127	− 2 40.2	+139
13	266 49.3	44 16.3	33.5	294 48.3	51.4	145 05.9	33.1	43 12.4	24.5	284 51.6	128	2 26.3	+140
14	281 51.8	59 18.8	32.9	309 49.1	50.7	160 08.5	33.2	58 14.6	24.6	299 23.4	126	2 12.3	+139
15	296 54.2	74 21.4	·· 32.4	324 49.9	·· 50.0	175 11.1	·· 33.2	73 16.8	·· 24.7	313 55.0	127	· 1 58.4	+140
16	311 56.7	89 23.9	31.8	339 50.7	49.3	190 13.7	33.2	88 19.0	24.8	328 26.7	126	1 44.4	+140
17	326 59.2	104 26.5	31.2	354 51.4	48.7	205 16.3	33.3	103 21.2	24.8	342 58.3	127	1 30.4	+141
18	342 01.6	119 29.0	−15 30.7	9 52.2	−12 48.0	220 18.9	+20 33.3	118 23.4	−14 24.9	357 30.0	125	− 1 16.3	+140
19	357 04.1	134 31.5	30.1	24 53.0	47.3	235 21.5	33.3	133 25.5	25.0	12 01.5	126	1 02.3	+141
20	12 06.6	149 34.0	29.5	39 53.8	46.6	250 24.1	33.4	148 27.7	25.1	26 33.1	125	0 48.2	+141
21	27 09.0	164 36.6	·· 29.0	54 54.6	·· 45.9	265 26.7	·· 33.4	163 29.9	·· 25.2	41 04.6	124	· 0 34.1	+141
22	42 11.5	179 39.1	28.4	69 55.4	45.2	280 29.3	33.4	178 32.1	25.2	55 36.0	125	0 20.0	+142
23	57 14.0	194 41.6	27.9	84 56.1	44.6	295 31.9	33.5	193 34.3	25.3	70 07.5	124	− 0 05.8	+142
4 0	72 16.4	209 44.1	−15 27.3	99 56.9	−12 43.9	310 34.6	+20 33.5	208 36.5	−14 25.4	84 38.9	123	+ 0 08.4	+141
1	87 18.9	224 46.6	26.7	114 57.7	43.2	325 37.2	33.5	223 38.7	25.5	99 10.2	124	0 22.5	+142
2	102 21.3	239 49.1	26.2	129 58.5	42.5	340 39.8	33.6	238 40.8	25.6	113 41.6	122	0 36.7	+142
3	117 23.8	254 51.6	·· 25.6	144 59.3	·· 41.8	355 42.4	·· 33.6	253 43.0	·· 25.6	128 12.8	123	· 0 50.9	+142
4	132 26.3	269 54.1	25.1	160 00.1	41.1	10 45.0	33.7	268 45.2	25.7	142 44.1	122	1 05.1	+143
5	147 28.7	284 56.5	24.6	175 00.8	40.4	25 47.6	33.7	283 47.4	25.8	157 15.3	121	1 19.4	+142
6	162 31.2	299 59.0	−15 24.0	190 01.6	−12 39.8	40 50.2	+20 33.7	298 49.6	−14 25.9	171 46.4	121	+ 1 33.6	+143
7	177 33.7	315 01.5	23.5	205 02.4	39.1	55 52.8	33.8	313 51.8	25.9	186 17.5	121	1 47.9	+142
8	192 36.1	330 04.0	22.9	220 03.2	38.4	70 55.4	33.8	328 54.0	26.0	200 48.6	120	2 02.1	+143
9	207 38.6	345 06.5	·· 22.4	235 04.0	·· 37.7	85 58.0	·· 33.8	343 56.2	·· 26.1	215 19.6	120	· 2 16.4	+143
10	222 41.1	0 08.9	21.9	250 04.8	37.0	101 00.6	33.9	358 58.3	26.2	229 50.6	119	2 30.7	+142
11	237 43.5	15 11.4	21.3	265 05.5	36.3	116 03.3	33.9	14 00.5	26.3	244 21.5	119	2 44.9	+143
12	252 46.0	30 13.8	−15 20.8	280 06.3	−12 35.6	131 05.9	+20 33.9	29 02.7	−14 26.3	258 52.4	118	+ 2 59.2	+143
13	267 48.4	45 16.3	20.3	295 07.1	35.0	146 08.5	34.0	44 04.9	26.4	273 23.2	117	3 13.5	+143
14	282 50.9	60 18.7	19.8	310 07.9	34.3	161 11.1	34.0	59 07.1	26.5	287 53.9	117	3 27.8	+143
15	297 53.4	75 21.2	·· 19.2	325 08.7	·· 33.6	176 13.7	·· 34.1	74 09.3	·· 26.6	302 24.6	117	· 3 42.1	+143
16	312 55.8	90 23.6	18.7	340 09.5	32.9	191 16.3	34.1	89 11.5	26.6	316 55.3	116	3 56.4	+142
17	327 58.3	105 26.1	18.2	355 10.3	32.2	206 18.9	34.1	104 13.6	26.7	331 25.9	115	4 10.6	+143
18	343 00.8	120 28.5	−15 17.7	10 11.0	−12 31.5	221 21.5	+20 34.2	119 15.8	−14 26.8	345 56.4	115	+ 4 24.9	+143
19	358 03.2	135 30.9	17.1	25 11.8	30.8	236 24.2	34.2	134 18.0	26.9	0 26.9	114	4 39.2	+142
20	13 05.7	150 33.4	16.6	40 12.6	30.1	251 26.8	34.2	149 20.2	27.0	14 57.3	113	4 53.4	+143
21	28 08.2	165 35.8	·· 16.1	55 13.4	·· 29.5	266 29.4	·· 34.3	164 22.4	·· 27.0	29 27.6	113	· 5 07.7	+142
22	43 10.6	180 38.2	15.6	70 14.2	28.8	281 32.0	34.3	179 24.6	27.1	43 57.9	112	5 21.9	+143
23	58 13.1	195 40.6	15.1	85 15.0	28.1	296 34.6	34.4	194 26.8	27.2	58 28.1	112	5 36.2	+142
5 0	73 15.6	210 43.0	−15 14.6	100 15.8	−12 27.4	311 37.2	+20 34.4	209 29.0	−14 27.3	72 58.3	111	+ 5 50.4	+142
1	88 18.0	225 45.4	14.1	115 16.5	26.7	326 39.8	34.4	224 31.1	27.3	87 28.4	110	6 04.6	+142
2	103 20.5	240 47.8	13.6	130 17.3	26.0	341 42.5	34.5	239 33.3	27.4	101 58.4	110	6 18.8	+142
3	118 22.9	255 50.2	·· 13.1	145 18.1	·· 25.3	356 45.1	·· 34.5	254 35.5	·· 27.5	116 28.4	108	· 6 33.0	+141
4	133 25.4	270 52.6	12.6	160 18.9	24.6	11 47.7	34.5	269 37.7	27.6	130 58.2	109	6 47.1	+142
5	148 27.9	285 55.0	12.1	175 19.7	23.9	26 50.3	34.6	284 39.9	27.7	145 28.1	107	7 01.3	+141
6	163 30.3	300 57.4	−15 11.6	190 20.5	−12 23.3	41 52.9	+20 34.6	299 42.1	−14 27.7	159 57.8	107	+ 7 15.4	+141
7	178 32.8	315 59.8	11.1	205 21.3	22.6	56 55.5	34.7	314 44.3	27.8	174 27.5	105	7 29.5	+141
8	193 35.3	331 02.2	10.6	220 22.0	21.9	71 58.2	34.7	329 46.5	27.9	188 57.0	106	7 43.6	+140
9	208 37.7	346 04.5	·· 10.1	235 22.8	·· 21.2	87 00.8	·· 34.7	344 48.6	·· 28.0	203 26.6	104	· 7 57.6	+140
10	223 40.2	1 06.9	09.6	250 23.6	20.5	102 03.4	34.8	359 50.8	28.0	217 56.0	104	8 11.6	+140
11	238 42.7	16 09.3	09.2	265 24.4	19.8	117 06.0	34.8	14 53.0	28.1	232 25.4	102	8 25.6	+140
12	253 45.1	31 11.6	−15 08.7	280 25.2	−12 19.1	132 08.6	+20 34.8	29 55.2	−14 28.2	246 54.6	102	+ 8 39.6	+139
13	268 47.6	46 14.0	08.2	295 26.0	18.4	147 11.3	34.9	44 57.4	28.3	261 23.8	102	8 53.5	+139
14	283 50.1	61 16.3	07.7	310 26.8	17.7	162 13.9	34.9	59 59.6	28.3	275 53.0	100	9 07.4	+139
15	298 52.5	76 18.7	·· 07.2	325 27.6	·· 17.0	177 16.5	·· 35.0	75 01.8	·· 28.4	290 22.0	100	· 9 21.3	+138
16	313 55.0	91 21.0	06.8	340 28.3	16.4	192 19.1	35.0	90 04.0	28.5	304 51.0	98	9 35.1	+138
17	328 57.4	106 23.4	06.3	355 29.1	15.7	207 21.7	35.0	105 06.2	28.6	319 19.8	98	9 48.9	+137
18	343 59.9	121 25.7	−15 05.8	10 29.9	−12 15.0	222 24.4	+20 35.1	120 08.3	−14 28.7	333 48.6	97	+10 02.6	+137
19	359 02.4	136 28.0	05.4	25 30.7	14.3	237 27.0	35.1	135 10.5	28.7	348 17.3	96	10 16.3	+137
20	14 04.8	151 30.4	04.9	40 31.5	13.6	252 29.6	35.2	150 12.7	28.8	2 45.9	96	10 30.0	+136
21	29 07.3	166 32.7	·· 04.4	55 32.3	·· 12.9	267 32.2	·· 35.2	165 14.9	·· 28.9	17 14.5	94	·10 43.6	+136
22	44 09.8	181 35.0	04.0	70 33.1	12.2	282 34.8	35.2	180 17.1	29.0	31 42.9	93	10 57.2	+135
23	59 12.2	196 37.3	03.5	85 33.8	11.5	297 37.5	35.3	195 19.3	29.0	46 11.2	93	11 10.7	+135
24	74 14.7	211 39.7	−15 03.0	100 34.6	−12 10.8	312 40.1	+20 35.3	210 21.5	−14 29.1	60 39.5	92	+11 24.2	+134
code	—	+ 25	+ 5	+ 8	+ 6	+ 26	+ 1	+ 22	− 1				

G M T	SUN GHA	SUN Dec.
h	° ′	° ′
3 0	182 37.2	−21 59.8
1	197 37.0	22 00.2
2	212 36.7	00.5
3	227 36.5	·· 00.9
4	242 36.2	01.3
5	257 36.0	01.6
6	272 35.7	−22 02.0
7	287 35.5	02.3
8	302 35.3	02.7
9	317 35.0	·· 03.1
10	332 34.8	03.4
11	347 34.5	03.8
12	2 34.3	−22 04.1
13	17 34.0	04.5
14	32 33.8	04.9
15	47 33.5	·· 05.2
16	62 33.3	05.6
17	77 33.1	05.9
18	92 32.8	−22 06.3
19	107 32.6	06.6
20	122 32.3	07.0
21	137 32.1	·· 07.3
22	152 31.8	07.7
23	167 31.6	08.0
4 0	182 31.3	−22 08.4
1	197 31.1	08.7
2	212 30.8	09.1
3	227 30.6	·· 09.4
4	242 30.3	09.8
5	257 30.1	10.1
6	272 29.8	−22 10.5
7	287 29.6	10.8
8	302 29.3	11.2
9	317 29.1	·· 11.5
10	332 28.8	11.8
11	347 28.6	12.2
12	2 28.3	−22 12.5
13	17 28.1	12.9
14	32 27.8	13.2
15	47 27.6	·· 13.5
16	62 27.3	13.9
17	77 27.1	14.2
18	92 26.8	−22 14.6
19	107 26.6	14.9
20	122 26.3	15.2
21	137 26.1	·· 15.6
22	152 25.8	15.9
23	167 25.6	16.2
5 0	182 25.3	−22 16.6
1	197 25.0	16.9
2	212 24.8	17.2
3	227 24.5	·· 17.6
4	242 24.3	17.9
5	257 24.0	18.2
6	272 23.8	−22 18.5
7	287 23.5	18.9
8	302 23.3	19.2
9	317 23.0	·· 19.5
10	332 22.7	19.8
11	347 22.5	20.2
12	2 22.2	−22 20.5
13	17 22.0	20.8
14	32 21.7	21.1
15	47 21.5	·· 21.4
16	62 21.2	21.8
17	77 21.0	22.1
18	92 20.7	−22 22.4
19	107 20.4	22.7
20	122 20.2	23.0
21	137 19.9	·· 23.4
22	152 19.7	23.7
23	167 19.4	24.0
24	182 19.1	−22 24.3
code	—	− 4

STARS No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.1	−40 29.1
5	Achernar	335 58.8	−57 28.0
30	Acrux	173 58.9	−62 50.8
19	Adhara	255 46.7	−28 54.5
10	Aldebaran	291 39.4	+16 25.3
32	Alioth	166 59.3	+56 11.9
34	Alkaid	153 33.7	+49 32.0
55	Al Na'ir	28 38.8	−47 10.9
15	Alnilam	276 30.6	− 1 13.7
25	Alphard	218 39.1	− 8 27.7
41	Alphecca	126 48.5	+26 51.8
1	Alpheratz	358 28.9	+28 50.8
51	Altair	62 51.3	+ 8 45.0
2	Ankaa	353 58.7	−42 33.1
42	Antares	113 20.5	−26 20.0
37	Arcturus	146 36.0	+19 24.9
43	Atria	109 02.3	−68 56.9
22	Avior	234 35.7	−59 21.6
13	Bellatrix	279 18.7	+ 6 18.7
16	Betelg'se	271 48.5	+ 7 24.1
17	Canopus	264 15.1	−52 40.1
12	Capella	281 38.8	+45 57.3
53	Deneb	50 01.7	+45 07.4
28	Denebola	183 18.4	+14 49.3
4	Diphda	349 39.7	−18 14.0
27	Dubhe	194 45.3	+61 59.3
14	Elnath	279 07.7	+28 34.3
47	Eltanin	91 07.1	+51 29.7
54	Enif	34 30.3	+ 9 40.2
56	Fomalhaut	16 12.3	−29 51.7
31	Gacrux	172 50.2	−56 51.5
29	Gienah	176 37.6	−17 17.5
35	Hadar	149 50.8	−60 09.3
6	Hamal	328 50.1	+23 15.2
48	Kaus Aust.	84 42.4	−34 24.5
40	Kochab	137 18.9	+74 20.1
57	Markab	14 22.1	+14 58.0
8	Menkar	315 00.6	+ 3 55.0
36	Menkent	148 59.7	−36 08.9
24	Miapl'dus	221 48.8	−69 31.6
9	Mirfak	309 42.8	+49 42.4
50	Nunki	76 53.0	−26 21.3
52	Peacock	54 28.6	−56 53.0
21	Pollux	244 21.0	+28 08.1
20	Procyon	245 45.4	+ 5 20.5
46	R'alhague	96 47.5	+12 35.5
26	Regulus	208 30.1	+12 11.2
11	Rigel	281 53.9	− 8 15.1
38	Rigil Kent.	140 52.4	−60 39.0
44	Sabik	103 03.2	−15 40.2
3	Schedar	350 30.4	+56 17.8
45	Shaula	97 21.9	−37 04.4
18	Sirius	259 12.1	−16 39.1
33	Spica	159 17.7	−10 55.6
23	Suhail	223 24.6	−43 14.8
49	Vega	81 09.1	+38 44.6
39	Zub'g'bi	137 54.3	−15 51.3

Lat.	Sunrise	Twlt. begins	Moonrise 3	4	5	6
N °	h m	h m	h m	h m	h m	h m
72	■	6 29	12 33	12 09	11 43	11 08
70	■	6 21	12 29	12 13	11 56	11 33
68	10 53	6 15	12 26	12 16	12 06	11 53
66	9 56	6 10	12 24	12 19	12 14	12 09
64	9 23	6 05	12 22	12 21	12 21	12 22
62	8 59	6 02	12 20	12 23	12 27	12 33
60	8 40	5 58	12 18	12 25	12 33	12 43
58	8 24	5 54	12 17	12 27	12 38	12 51
56	8 11	5 50	12 16	12 28	12 42	12 58
54	7 59	5 47	12 15	12 29	12 46	13 05
52	7 49	5 45	12 13	12 31	12 49	13 11
50	7 40	5 42	12 13	12 32	12 52	13 17
45	7 21	5 35	12 10	12 34	12 59	13 28
40	7 05	5 28	12 09	12 36	13 05	13 38
35	6 52	5 21	12 07	12 38	13 10	13 47
30	6 40	5 14	12 06	12 39	13 15	13 54
20	6 20	5 02	12 03	12 42	13 23	14 07
10	6 03	4 47	12 01	12 44	13 30	14 19
0	5 46	4 32	11 59	12 47	13 36	14 29
10	5 30	4 13	11 57	12 49	13 43	14 40
20	5 12	3 49	11 55	12 51	13 50	14 52
30	4 51	3 16	11 53	12 54	13 58	15 06
35	4 39	2 55	11 52	12 56	14 03	15 14
40	4 25	2 26	11 50	12 58	14 09	15 23
45	4 08	1 45	11 48	13 00	14 15	15 33
50	3 47	////	11 46	13 03	14 23	15 46
52	3 37	////	11 45	13 04	14 26	15 52
54	3 26	////	11 44	13 06	14 30	15 59
56	3 13	////	11 43	13 07	14 35	16 07
58	2 58	////	11 42	13 09	14 40	16 15
60	2 40	////	11 40	13 11	14 45	16 25
S						

Lat.	Sunset	Twlt. ends	Moonset 3	4	5	6
N °	h m	h m	h m	h m	h m	h m
72	■	17 09	24 23	0 23	2 32	4 57
70	■	17 16	24 23	0 23	2 23	4 33
68	12 47	17 22	24 23	0 23	2 15	4 16
66	13 44	17 28	24 23	0 23	2 09	4 01
64	14 17	17 33	24 23	0 23	2 03	3 50
62	14 41	17 37	24 23	0 23	1 59	3 40
60	15 00	17 41	24 23	0 23	1 55	3 31
58	15 16	17 45	24 23	0 23	1 51	3 24
56	15 29	17 48	24 22	0 22	1 48	3 17
54	15 41	17 52	24 22	0 22	1 45	3 12
52	15 51	17 55	24 22	0 22	1 43	3 07
50	16 00	17 58	24 22	0 22	1 40	3 02
45	16 19	18 04	24 22	0 22	1 35	2 52
40	16 35	18 12	24 22	0 22	1 31	2 43
35	16 48	18 18	24 22	0 22	1 28	2 36
30	17 00	18 25	24 22	0 22	1 25	2 30
20	17 20	18 38	24 22	0 22	1 19	2 19
10	17 37	18 52	24 22	0 22	1 14	2 10
0	17 54	19 08	24 22	0 22	1 10	2 01
10	18 10	19 27	24 21	0 21	1 05	1 52
20	18 28	19 51	24 21	0 21	1 01	1 43
30	18 49	20 24	24 21	0 21	0 55	1 32
35	19 01	20 46	24 21	0 21	0 52	1 26
40	19 15	21 14	24 21	0 21	0 49	1 19
45	19 32	21 57	24 20	0 20	0 44	1 11
50	19 53	////	0 01	0 20	0 40	1 02
52	20 03	////	0 03	0 20	0 37	0 57
54	20 14	////	0 05	0 20	0 35	0 52
56	20 27	////	0 08	0 20	0 32	0 47
58	20 43	////	0 10	0 20	0 29	0 41
60	21 01	////	0 13	0 19	0 26	0 34
S						

G M T	Equation of Time (App.—Mean) 3	4	5
h	m s	m s	m s
0	+10 29.3	+10 05.8	+ 9 41.7
6	+10 23.5	+ 9 59.8	+ 9 35.6
12	+10 17.6	+ 9 53.8	+ 9 29.5
18	+10 11.7	+ 9 47.8	+ 9 23.3
24	+10 05.8	+ 9 41.7	+ 9 17.1

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
3	18 10	10 03	17 21	3 21	10 08
4	18 58	9 59	17 19	3 17	10 04
5	19 49	9 56	17 18	3 13	10 01
6	20 43	9 52	17 17	3 09	9 57

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.6	0.5	0.1
30			
	0.6	0.4	0.1
45			
	0.6	0.3	0.1
60			
	0.6	0.2	0.0
75			
	0.6	0.1	0.0
90			

Moon's Lower Limb **Add**

Alt.	3	4	5
°	′	′	′
0			
	16.7	17.7	18.7
4			
	16.7	17.7	18.7
8			
	16.7	17.7	18.7
12			
	16.7	17.7	18.7
16			
	16.7	17.6	18.6
20			
	16.6	17.6	18.6
24			
	16.6	17.5	18.5
28			
	16.6	17.5	18.4
32			
	16.5	17.4	18.3
36			
	16.5	17.4	18.2
40			
	16.5	17.3	18.1
44			
	16.4	17.2	18.0
48			
	16.4	17.1	17.8
52			
	16.3	17.0	17.7
56			
	16.3	16.9	17.6
60			
	16.2	16.8	17.4
64			
	16.2	16.7	17.2
68			
	16.1	16.6	17.1
72			
	16.0	16.5	16.9
76			
	16.0	16.4	16.8
80			
	15.9	16.3	16.6
84			
	15.9	16.1	16.4
88			
	15.8	16.0	16.3
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	3	4	5
°	′	′	′
0			
	14.9	14.3	13.7
4			
	14.9	14.3	13.7
8			
	14.9	14.3	13.8
12			
	14.9	14.4	13.8
16			
	14.9	14.4	13.9
20			
	15.0	14.4	13.9
24			
	15.0	14.5	14.0
28			
	15.0	14.5	14.1
32			
	15.0	14.6	14.2
36			
	15.1	14.7	14.3
40			
	15.1	14.8	14.4
44			
	15.2	14.8	14.5
48			
	15.2	14.9	14.6
52			
	15.3	15.0	14.8
56			
	15.3	15.1	14.9
60			
	15.4	15.2	15.1
64			
	15.4	15.3	15.2
68			
	15.5	15.4	15.4
72			
	15.5	15.5	15.5
76			
	15.6	15.7	15.7
80			
	15.7	15.8	15.9
84			
	15.7	15.9	16.1
88			
	15.8	16.0	16.2
90			

Subtract from table, back cover

First Quarter 3

GMT	♈ GHA	VENUS −4.2 GHA	VENUS Dec.	MARS 0.6 GHA	MARS Dec.	JUPITER −2.1 GHA	JUPITER Dec.	SATURN 0.8 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
6 0	74 14.7	211 39.7	−15 03.0	100 34.6	−12 10.8	312 40.1	+20 35.3	210 21.5	−14 29.1	60 39.5	92	+11 24.2	+134
1	89 17.2	226 42.0	02.6	115 35.4	10.1	327 42.7	35.4	225 23.7	29.2	75 07.7	90	11 37.6	+134
2	104 19.6	241 44.3	02.1	130 36.2	09.4	342 45.3	35.4	240 25.9	29.3	89 35.7	90	11 51.0	+133
3	119 22.1	256 46.6	·· 01.7	145 37.0	·· 08.7	357 48.0	·· 35.4	255 28.0	·· 29.3	104 03.7	89	·12 04.3	+133
4	134 24.6	271 48.9	01.2	160 37.8	08.1	12 50.6	35.5	270 30.2	29.4	118 31.6	88	12 17.6	+132
5	149 27.0	286 51.2	00.8	175 38.6	07.4	27 53.2	35.5	285 32.4	29.5	132 59.4	87	12 30.8	+131
6	164 29.5	301 53.5	−15 00.3	190 39.4	−12 06.7	42 55.8	+20 35.6	300 34.6	−14 29.6	147 27.1	86	+12 43.9	+131
7	179 31.9	316 55.8	14 59.9	205 40.1	06.0	57 58.5	35.6	315 36.8	29.6	161 54.7	85	12 57.0	+130
8	194 34.4	331 58.0	59.4	220 40.9	05.3	73 01.1	35.6	330 39.0	29.7	176 22.2	84	13 10.0	+130
9	209 36.9	347 00.3	·· 59.0	235 41.7	·· 04.6	88 03.7	·· 35.7	345 41.2	·· 29.8	190 49.6	83	·13 23.0	+128
10	224 39.3	2 02.6	58.6	250 42.5	03.9	103 06.3	35.7	0 43.4	29.9	205 16.9	82	13 35.8	+129
11	239 41.8	17 04.9	58.1	265 43.3	03.2	118 09.0	35.7	15 45.6	30.0	219 44.1	81	13 48.7	+127
12	254 44.3	32 07.1	−14 57.7	280 44.1	−12 02.5	133 11.6	+20 35.8	30 47.7	−14 30.0	234 11.2	80	+14 01.4	+127
13	269 46.7	47 09.4	57.3	295 44.9	01.8	148 14.2	35.8	45 49.9	30.1	248 38.2	79	14 14.1	+126
14	284 49.2	62 11.7	56.8	310 45.7	01.1	163 16.9	35.9	60 52.1	30.2	263 05.1	78	14 26.7	+125
15	299 51.7	77 13.9	·· 56.4	325 46.5	·12 00.4	178 19.5	·· 35.9	75 54.3	·· 30.3	277 31.9	77	·14 39.2	+124
16	314 54.1	92 16.2	56.0	340 47.2	11 59.7	193 22.1	35.9	90 56.5	30.3	291 58.6	76	14 51.6	+124
17	329 56.6	107 18.4	55.5	355 48.0	59.0	208 24.7	36.0	105 58.7	30.4	306 25.2	74	15 04.0	+122
18	344 59.1	122 20.7	−14 55.1	10 48.8	−11 58.3	223 27.4	+20 36.0	121 00.9	−14 30.5	320 51.6	74	+15 16.2	+122
19	0 01.5	137 22.9	54.7	25 49.6	57.6	238 30.0	36.1	136 03.1	30.6	335 18.0	73	15 28.4	+121
20	15 04.0	152 25.1	54.3	40 50.4	56.9	253 32.6	36.1	151 05.3	30.6	349 44.3	72	15 40.5	+120
21	30 06.4	167 27.4	·· 53.9	55 51.2	·· 56.2	268 35.3	·· 36.2	166 07.5	·· 30.7	4 10.5	71	·15 52.5	+120
22	45 08.9	182 29.6	53.5	70 52.0	55.6	283 37.9	36.2	181 09.6	30.8	18 36.6	69	16 04.5	+118
23	60 11.4	197 31.8	53.0	85 52.8	54.9	298 40.5	36.2	196 11.8	30.9	33 02.5	69	16 16.3	+117
7 0	75 13.8	212 34.0	−14 52.6	100 53.6	−11 54.2	313 43.2	+20 36.3	211 14.0	−14 30.9	47 28.4	67	+16 28.0	+117
1	90 16.3	227 36.3	52.2	115 54.3	53.5	328 45.8	36.3	226 16.2	31.0	61 54.1	67	16 39.7	+115
2	105 18.8	242 38.5	51.8	130 55.1	52.8	343 48.4	36.4	241 18.4	31.1	76 19.8	65	16 51.2	+115
3	120 21.2	257 40.7	·· 51.4	145 55.9	·· 52.1	358 51.0	·· 36.4	256 20.6	·· 31.2	90 45.3	65	·17 02.7	+113
4	135 23.7	272 42.9	51.0	160 56.7	51.4	13 53.7	36.4	271 22.8	31.3	105 10.8	63	17 14.0	+112
5	150 26.2	287 45.1	50.6	175 57.5	50.7	28 56.3	36.5	286 25.0	31.3	119 36.1	62	17 25.2	+112
6	165 28.6	302 47.3	−14 50.2	190 58.3	−11 50.0	43 58.9	+20 36.5	301 27.2	−14 31.4	134 01.3	62	+17 36.4	+110
7	180 31.1	317 49.5	49.8	205 59.1	49.3	59 01.6	36.6	316 29.4	31.5	148 26.5	60	17 47.4	+109
8	195 33.5	332 51.7	49.4	220 59.9	48.6	74 04.2	36.6	331 31.5	31.6	162 51.5	59	17 58.3	+108
9	210 36.0	347 53.9	·· 49.0	236 00.7	·· 47.9	89 06.8	·· 36.6	346 33.7	·· 31.6	177 16.4	58	·18 09.1	+107
10	225 38.5	2 56.0	48.6	251 01.5	47.2	104 09.5	36.7	1 35.9	31.7	191 41.2	57	18 19.8	+105
11	240 40.9	17 58.2	48.2	266 02.2	46.5	119 12.1	36.7	16 38.1	31.8	206 05.9	56	18 30.3	+105
12	255 43.4	33 00.4	−14 47.8	281 03.0	−11 45.8	134 14.8	+20 36.8	31 40.3	−14 31.9	220 30.5	55	+18 40.8	+103
13	270 45.9	48 02.6	47.5	296 03.8	45.1	149 17.4	36.8	46 42.5	31.9	234 55.0	54	18 51.1	+102
14	285 48.3	63 04.7	47.1	311 04.6	44.4	164 20.0	36.8	61 44.7	32.0	249 19.4	53	19 01.3	+101
15	300 50.8	78 06.9	·· 46.7	326 05.4	·· 43.7	179 22.7	·· 36.9	76 46.9	·· 32.1	263 43.7	52	·19 11.4	+100
16	315 53.3	93 09.1	46.3	341 06.2	43.0	194 25.3	36.9	91 49.1	32.2	278 07.9	50	19 21.4	+ 98
17	330 55.7	108 11.2	45.9	356 07.0	42.3	209 27.9	37.0	106 51.3	32.2	292 31.9	50	19 31.2	+ 97
18	345 58.2	123 13.4	−14 45.6	11 07.8	−11 41.6	224 30.6	+20 37.0	121 53.5	−14 32.3	306 55.9	49	+19 40.9	+ 96
19	1 00.7	138 15.5	45.2	26 08.6	40.9	239 33.2	37.1	136 55.6	32.4	321 19.8	48	19 50.5	+ 94
20	16 03.1	153 17.7	44.8	41 09.4	40.2	254 35.8	37.1	151 57.8	32.5	335 43.6	47	19 59.9	+ 93
21	31 05.6	168 19.8	·· 44.4	56 10.2	·· 39.5	269 38.5	·· 37.1	167 00.0	·· 32.5	350 07.3	46	·20 09.2	+ 92
22	46 08.0	183 21.9	44.1	71 10.9	38.8	284 41.1	37.2	182 02.2	32.6	4 30.9	44	20 18.4	+ 90
23	61 10.5	198 24.1	43.7	86 11.7	38.1	299 43.8	37.2	197 04.4	32.7	18 54.3	44	20 27.4	+ 89
8 0	76 13.0	213 26.2	−14 43.3	101 12.5	−11 37.4	314 46.4	+20 37.3	212 06.6	−14 32.8	33 17.7	43	+20 36.3	+ 88
1	91 15.4	228 28.3	43.0	116 13.3	36.7	329 49.0	37.3	227 08.8	32.8	47 41.0	42	20 45.1	+ 86
2	106 17.9	243 30.4	42.6	131 14.1	36.0	344 51.7	37.4	242 11.0	32.9	62 04.2	41	20 53.7	+ 84
3	121 20.4	258 32.6	·· 42.3	146 14.9	·· 35.3	359 54.3	·· 37.4	257 13.2	·· 33.0	76 27.3	40	·21 02.1	+ 83
4	136 22.8	273 34.7	41.9	161 15.7	34.6	14 57.0	37.4	272 15.4	33.1	90 50.3	40	21 10.4	+ 82
5	151 25.3	288 36.8	41.6	176 16.5	33.9	29 59.6	37.5	287 17.6	33.1	105 13.3	38	21 18.6	+ 80
6	166 27.8	303 38.9	−14 41.2	191 17.3	−11 33.2	45 02.2	+20 37.5	302 19.8	−14 33.2	119 36.1	38	+21 26.6	+ 79
7	181 30.2	318 41.0	40.9	206 18.1	32.5	60 04.9	37.6	317 21.9	33.3	133 58.9	36	21 34.5	+ 77
8	196 32.7	333 43.1	40.5	221 18.9	31.8	75 07.5	37.6	332 24.1	33.4	148 21.5	36	21 42.2	+ 75
9	211 35.2	348 45.2	·· 40.2	236 19.7	·· 31.1	90 10.2	·· 37.7	347 26.3	·· 33.4	162 44.1	35	·21 49.7	+ 74
10	226 37.6	3 47.3	39.8	251 20.4	30.4	105 12.8	37.7	2 28.5	33.5	177 06.6	34	21 57.1	+ 72
11	241 40.1	18 49.4	39.5	266 21.2	29.7	120 15.5	37.7	17 30.7	33.6	191 29.0	33	22 04.3	+ 71
12	256 42.5	33 51.5	−14 39.1	281 22.0	−11 29.0	135 18.1	+20 37.8	32 32.9	−14 33.7	205 51.3	33	+22 11.4	+ 69
13	271 45.0	48 53.5	38.8	296 22.8	28.3	150 20.7	37.8	47 35.1	33.7	220 13.6	32	22 18.3	+ 67
14	286 47.5	63 55.6	38.5	311 23.6	27.6	165 23.4	37.9	62 37.3	33.8	234 35.8	31	22 25.0	+ 66
15	301 49.9	78 57.7	·· 38.1	326 24.4	·· 26.9	180 26.0	·· 37.9	77 39.5	·· 33.9	248 57.9	30	·22 31.6	+ 64
16	316 52.4	93 59.8	37.8	341 25.2	26.2	195 28.7	38.0	92 41.7	34.0	263 19.9	29	22 38.0	+ 63
17	331 54.9	109 01.8	37.5	356 26.0	25.5	210 31.3	38.0	107 43.9	34.0	277 41.8	29	22 44.3	+ 60
18	346 57.3	124 03.9	−14 37.1	11 26.8	−11 24.8	225 34.0	+20 38.0	122 46.1	−14 34.1	292 03.7	28	+22 50.3	+ 59
19	1 59.8	139 05.9	36.8	26 27.6	24.1	240 36.6	38.1	137 48.3	34.2	306 25.5	28	22 56.2	+ 58
20	17 02.3	154 08.0	36.5	41 28.4	23.4	255 39.3	38.1	152 50.4	34.3	320 47.3	27	23 02.0	+ 55
21	32 04.7	169 10.0	·· 36.2	56 29.2	·· 22.7	270 41.9	·· 38.2	167 52.6	·· 34.3	335 09.0	26	·23 07.5	+ 54
22	47 07.2	184 12.1	35.8	71 30.0	22.0	285 44.5	38.2	182 54.8	34.4	349 30.6	26	23 12.9	+ 52
23	62 09.7	199 14.1	35.5	86 30.7	21.3	300 47.2	38.3	197 57.0	34.5	3 52.2	25	23 18.1	+ 50
24	77 12.1	214 16.2	−14 35.2	101 31.5	−11 20.6	315 49.8	+20 38.3	212 59.2	−14 34.6	18 13.7	25	+23 23.1	+ 49
code	—	+ 22	+ 3	+ 8	+ 7	+ 26	0	+ 22	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
6 0	182 19.1	−22 24.3
1	197 18.9	24.6
2	212 18.6	24.9
3	227 18.4 ··	25.2
4	242 18.1	25.5
5	257 17.8	25.9
6	272 17.6	−22 26.2
7	287 17.3	26.5
8	302 17.1	26.8
9	317 16.8 ··	27.1
10	332 16.5	27.4
11	347 16.3	27.7
12	2 16.0	−22 28.0
13	17 15.7	28.3
14	32 15.5	28.6
15	47 15.2 ··	28.9
16	62 15.0	29.2
17	77 14.7	29.5
18	92 14.4	−22 29.8
19	107 14.2	30.1
20	122 13.9	30.4
21	137 13.6 ··	30.7
22	152 13.4	31.0
23	167 13.1	31.3
7 0	182 12.8	−22 31.6
1	197 12.6	31.9
2	212 12.3	32.2
3	227 12.1 ··	32.5
4	242 11.8	32.8
5	257 11.5	33.1
6	272 11.3	−22 33.3
7	287 11.0	33.6
8	302 10.7	33.9
9	317 10.5 ··	34.2
10	332 10.2	34.5
11	347 09.9	34.8
12	2 09.7	−22 35.1
13	17 09.4	35.4
14	32 09.1	35.6
15	47 08.9 ··	35.9
16	62 08.6	36.2
17	77 08.3	36.5
18	92 08.0	−22 36.8
19	107 07.8	37.1
20	122 07.5	37.3
21	137 07.2 ··	37.6
22	152 07.0	37.9
23	167 06.7	38.2
8 0	182 06.4	−22 38.5
1	197 06.2	38.7
2	212 05.9	39.0
3	227 05.6 ··	39.3
4	242 05.3	39.6
5	257 05.1	39.8
6	272 04.8	−22 40.1
7	287 04.5	40.4
8	302 04.3	40.6
9	317 04.0 ··	40.9
10	332 03.7	41.2
11	347 03.4	41.4
12	2 03.2	−22 41.7
13	17 02.9	42.0
14	32 02.6	42.2
15	47 02.4 ··	42.5
16	62 02.1	42.8
17	77 01.8	43.0
18	92 01.5	−22 43.3
19	107 01.3	43.6
20	122 01.0	43.8
21	137 00.7 ··	44.1
22	152 00.4	44.4
23	167 00.2	44.6
24	181 59.9	−22 44.9
code	—	− 3

STARS No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.2	−40 29.1
5	Achernar	335 58.8	−57 28.0
30	Acrux	173 58.8	−62 50.8
19	Adhara	255 46.7	−28 54.5
10	Aldebaran	291 39.4	+16 25.3
32	Alioth	166 59.3	+56 11.9
34	Alkaid	153 33.7	+49 32.0
55	Al Na'ir	28 38.8	−47 10.9
15	Alnilam	276 30.5	− 1 13.7
25	Alphard	218 39.0	− 8 27.7
41	Alphecca	126 48.5	+26 51.8
1	Alpheratz	358 28.9	+28 50.8
51	Altair	62 51.3	+ 8 45.0
2	Ankaa	353 58.7	−42 33.1
42	Antares	113 20.5	−26 20.0
37	Arcturus	146 36.0	+19 24.8
43	Atria	109 02.3	−68 56.9
22	Avior	234 35.6	−59 21.6
13	Bellatrix	279 18.7	+ 6 18.7
16	Betelg'se	271 48.4	+ 7 24.1
17	Canopus	264 15.1	−52 40.1
12	Capella	281 38.8	+45 57.3
53	Deneb	50 01.7	+45 07.4
28	Denebola	183 18.4	+14 49.3
4	Diphda	349 39.7	−18 14.0
27	Dubhe	194 45.2	+61 59.3
14	Elnath	279 07.7	+28 34.3
47	Eltanin	91 07.1	+51 29.7
54	Enif	34 30.3	+ 9 40.2
56	Fomalhaut	16 12.3	−29 51.7
31	Gacrux	172 50.2	−56 51.5
29	Gienah	176 37.6	−17 17.5
35	Hadar	149 50.8	−60 09.3
6	Hamal	328 50.1	+23 15.2
48	Kaus Aust.	84 42.4	−34 24.5
40	Kochab	137 18.8	+74 20.1
57	Markab	14 22.1	+14 58.0
8	Menkar	315 00.6	+ 3 55.0
36	Menkent	148 59.7	−36 08.9
24	Miapl'dus	221 48.8	−69 31.7
9	Mirfak	309 42.8	+49 42.4
50	Nunki	76 53.0	−26 21.3
52	Peacock	54 28.6	−56 53.0
21	Pollux	244 21.0	+28 08.1
20	Procyon	245 45.3	+ 5 20.5
46	R'alhague	96 47.5	+12 35.5
26	Regulus	208 30.1	+12 11.2
11	Rigel	281 53.9	− 8 15.1
38	Rigil Kent.	140 52.4	−60 39.0
44	Sabik	103 03.2	−15 40.3
3	Schedar	350 30.5	+56 17.8
45	Shaula	97 21.9	−37 04.4
18	Sirius	259 12.1	−16 39.1
33	Spica	159 17.7	−10 55.6
23	Suhail	223 24.6	−43 14.8
49	Vega	81 09.1	+38 44.6
39	Zub'g'bi	137 54.3	−15 51.3

Lat.	Sunrise	Twlt. begins	Moonrise 6	Moonrise 7	Moonrise 8	Moonrise 9
N °	h m	h m	h m	h m	h m	h m
72	■	6 35	11 08	□	□	□
70	■	6 28	11 33	10 54	□	□
68	11 15	6 20	11 53	11 35	10 40	□
66	10 06	6 15	12 09	12 03	11 56	11 30
64	9 30	6 10	12 22	12 25	12 33	12 56
62	9 05	6 06	12 33	12 42	13 00	13 34
60	8 45	6 02	12 43	12 57	13 21	14 01
58	8 29	5 58	12 51	13 10	13 38	14 22
56	8 15	5 54	12 58	13 20	13 52	14 39
54	8 03	5 51	13 05	13 30	14 05	14 54
52	7 53	5 48	13 11	13 39	14 16	15 07
50	7 44	5 44	13 17	13 47	14 26	15 18
45	7 24	5 37	13 28	14 03	14 47	15 42
40	7 08	5 30	13 38	14 17	15 04	16 01
35	6 54	5 23	13 47	14 29	15 18	16 17
30	6 43	5 17	13 54	14 39	15 31	16 30
20	6 22	5 03	14 07	14 57	15 52	16 54
10	6 04	4 49	14 19	15 12	16 11	17 14
0	5 48	4 32	14 29	15 27	16 29	17 33
10	5 31	4 13	14 40	15 42	16 46	17 53
20	5 12	3 49	14 52	15 58	17 06	18 13
30	4 51	3 16	15 06	16 16	17 28	18 37
35	4 39	2 54	15 14	16 27	17 40	18 51
40	4 24	2 25	15 23	16 39	17 56	19 07
45	4 07	1 40	15 33	16 54	18 13	19 27
50	3 46	////	15 46	17 12	18 36	19 51
52	3 36	////	15 52	17 20	18 46	20 03
54	3 24	////	15 59	17 30	18 58	20 16
56	3 11	////	16 07	17 41	19 12	20 32
58	2 55	////	16 15	17 53	19 29	20 50
60	2 37	////	16 25	18 08	19 48	21 12
S						

Lat.	Sunset	Twlt. ends	Moonset 6	Moonset 7	Moonset 8	Moonset 9
N °	h m	h m	h m	h m	h m	h m
72	■	17 05	4 57	□	□	□
70	■	17 13	4 33	7 11	□	□
68	12 27	17 20	4 16	6 31	9 33	□
66	13 37	17 26	4 01	6 04	8 18	10 57
64	14 12	17 31	3 50	5 43	7 41	9 32
62	14 37	17 35	3 40	5 26	7 15	8 55
60	14 57	17 40	3 31	5 13	6 55	8 28
58	15 13	17 43	3 24	5 01	6 38	8 07
56	15 27	17 47	3 17	4 50	6 24	7 50
54	15 39	17 51	3 12	4 41	6 12	7 36
52	15 49	17 53	3 07	4 33	6 01	7 23
50	15 59	17 57	3 02	4 26	5 51	7 12
45	16 19	18 05	2 52	4 11	5 31	6 49
40	16 35	18 12	2 43	3 59	5 15	6 30
35	16 48	18 18	2 36	3 48	5 02	6 14
30	17 00	18 25	2 30	3 39	4 50	6 01
20	17 21	18 39	2 19	3 23	4 30	5 38
10	17 38	18 53	2 10	3 09	4 12	5 18
0	17 55	19 10	2 01	2 56	3 56	4 59
10	18 12	19 29	1 52	2 43	3 39	4 41
20	18 30	19 53	1 43	2 30	3 22	4 21
30	18 51	20 26	1 32	2 14	3 02	3 58
35	19 04	20 49	1 26	2 05	2 50	3 44
40	19 18	21 19	1 19	1 55	2 37	3 29
45	19 35	22 03	1 11	1 43	2 21	3 10
50	19 57	////	1 02	1 28	2 02	2 47
52	20 07	////	0 57	1 21	1 53	2 36
54	20 19	////	0 52	1 14	1 43	2 24
56	20 32	////	0 47	1 06	1 32	2 10
58	20 48	////	0 41	0 56	1 18	1 53
60	21 07	////	0 34	0 46	1 03	1 33
S						

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.6	0.4	0.1
30			
	0.6	0.4	0.1
45			
	0.6	0.3	0.1
60			
	0.6	0.2	0.0
75			
	0.6	0.1	0.0
90			

Moon's Lower Limb Add

Alt.	6	7	8
°	′	′	′
0			
	19.6	20.4	20.8
4			
	19.6	20.4	20.7
8			
	19.6	20.3	20.7
12			
	19.5	20.3	20.6
16			
	19.5	20.2	20.6
20			
	19.4	20.1	20.5
24			
	19.3	20.0	20.4
28			
	19.2	19.9	20.2
32			
	19.1	19.7	20.1
36			
	18.9	19.6	19.9
40			
	18.8	19.4	19.7
44			
	18.6	19.2	19.5
48			
	18.5	19.0	19.3
52			
	18.3	18.8	19.1
56			
	18.1	18.6	18.8
60			
	17.9	18.4	18.6
64			
	17.7	18.1	18.3
68			
	17.5	17.9	18.1
72			
	17.3	17.6	17.8
76			
	17.1	17.4	17.5
80			
	16.9	17.1	17.2
84			
	16.6	16.9	17.0
88			
	16.5	16.7	16.7
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	6	7	8
°	′	′	′
0			
	13.2	12.8	12.6
4			
	13.2	12.8	12.6
8			
	13.3	12.8	12.6
12			
	13.3	12.9	12.7
16			
	13.4	13.0	12.8
20			
	13.5	13.1	12.9
24			
	13.5	13.2	13.0
28			
	13.6	13.3	13.1
32			
	13.8	13.4	13.3
36			
	13.9	13.6	13.4
40			
	14.0	13.8	13.6
44			
	14.2	13.9	13.8
48			
	14.4	14.1	14.0
52			
	14.5	14.3	14.3
56			
	14.7	14.6	14.5
60			
	14.9	14.8	14.7
64			
	15.1	15.0	15.0
68			
	15.3	15.3	15.3
72			
	15.5	15.5	15.5
76			
	15.8	15.8	15.8
80			
	16.0	16.1	16.1
84			
	16.2	16.3	16.4
88			
	16.4	16.5	16.6
90			

Subtract from table, back cover

GMT	Equation of Time (App.—Mean) 6	7	8
h	m s	m s	m s
0	+ 9 17.1	+ 8 51.9	+ 8 26.3
6	+ 9 10.8	+ 8 45.5	+ 8 19.8
12	+ 9 04.6	+ 8 39.2	+ 8 13.3
18	+ 8 58.3	+ 8 32.7	+ 8 06.7
24	+ 8 51.9	+ 8 26.3	+ 8 00.1

GMT of Transit Meridian of Greenwich DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
6	20 43	9 52	17 17	3 09	9 57
7	21 41	9 48	17 16	3 05	9 54
8	22 44	9 45	17 14	3 00	9 50
9	23 49	9 42	17 13	2 56	9 47

Day	GMT h	♈ GHA	VENUS −4.3 GHA	VENUS Dec.	MARS 0.6 GHA	MARS Dec.	JUPITER −2.1 GHA	JUPITER Dec.	SATURN 0.8 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
		° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
9	0	77 12.1	214 16.2	−14 35.2	101 31.5	−11 20.6	315 49.8	+20 38.3	212 59.2	−14 34.6	18 13.7	25	+23 23.1	+ 49
	1	92 14.6	229 18.2	34.9	116 32.3	19.9	330 52.5	38.3	228 01.4	34.6	32 35.2	24	23 28.0	+ 47
	2	107 17.0	244 20.2	34.6	131 33.1	19.2	345 55.1	38.4	243 03.6	34.7	46 56.6	24	23 32.7	+ 44
	3	122 19.5	259 22.3	•• 34.3	146 33.9	•• 18.5	0 57.8	•• 38.4	258 05.8	•• 34.8	61 18.0	23	·23 37.1	+ 44
	4	137 22.0	274 24.3	33.9	161 34.7	17.8	16 00.4	38.5	273 08.0	34.9	75 39.3	22	23 41.5	+ 41
	5	152 24.4	289 26.3	33.6	176 35.5	17.1	31 03.1	38.5	288 10.2	34.9	90 00.5	23	23 45.6	+ 39
	6	167 26.9	304 28.3	−14 33.3	191 36.3	−11 16.4	46 05.7	+20 38.6	303 12.4	−14 35.0	104 21.8	22	+23 49.5	+ 38
	7	182 29.4	319 30.3	33.0	206 37.1	15.7	61 08.4	38.6	318 14.6	35.1	118 43.0	21	23 53.3	+ 36
	8	197 31.8	334 32.3	32.7	221 37.9	14.9	76 11.0	38.7	333 16.8	35.2	133 04.1	22	23 56.9	+ 34
	9	212 34.3	349 34.3	•• 32.4	236 38.7	•• 14.2	91 13.7	•• 38.7	348 19.0	•• 35.2	147 25.3	21	·24 00.3	+ 32
	10	227 36.8	4 36.4	32.1	251 39.5	13.5	106 16.3	38.7	3 21.2	35.3	161 46.4	20	24 03.5	+ 30
	11	242 39.2	19 38.3	31.8	266 40.3	12.8	121 19.0	38.8	18 23.3	35.4	176 07.4	21	24 06.5	+ 29
	12	257 41.7	34 40.3	−14 31.5	281 41.1	−11 12.1	136 21.6	+20 38.8	33 25.5	−14 35.5	190 28.5	20	+24 09.4	+ 26
	13	272 44.1	49 42.3	31.2	296 41.9	11.4	151 24.3	38.9	48 27.7	35.5	204 49.5	20	24 12.0	+ 25
	14	287 46.6	64 44.3	30.9	311 42.7	10.7	166 26.9	38.9	63 29.9	35.6	219 10.5	20	24 14.5	+ 22
	15	302 49.1	79 46.3	•• 30.7	326 43.4	•• 10.0	181 29.6	•• 39.0	78 32.1	•• 35.7	233 31.5	19	·24 16.7	+ 21
	16	317 51.5	94 48.3	30.4	341 44.2	09.3	196 32.2	39.0	93 34.3	35.8	247 52.4	20	24 18.8	+ 19
	17	332 54.0	109 50.3	30.1	356 45.0	08.6	211 34.9	39.1	108 36.5	35.8	262 13.4	19	24 20.7	+ 17
	18	347 56.5	124 52.2	−14 29.8	11 45.8	−11 07.9	226 37.5	+20 39.1	123 38.7	−14 35.9	276 34.3	20	+24 22.4	+ 16
	19	2 58.9	139 54.2	29.5	26 46.6	07.2	241 40.2	39.1	138 40.9	36.0	290 55.3	19	24 24.0	+ 13
	20	18 01.4	154 56.2	29.2	41 47.4	06.5	256 42.8	39.2	153 43.1	36.1	305 16.2	19	24 25.3	+ 11
	21	33 03.9	169 58.1	•• 29.0	56 48.2	•• 05.8	271 45.5	•• 39.2	168 45.3	•• 36.1	319 37.1	20	·24 26.4	+ 10
	22	48 06.3	185 00.1	28.7	71 49.0	05.1	286 48.2	39.3	183 47.5	36.2	333 58.1	19	24 27.4	+ 8
	23	63 08.8	200 02.0	28.4	86 49.8	04.4	301 50.8	39.3	198 49.7	36.3	348 19.0	20	24 28.2	+ 5
10	0	78 11.3	215 04.0	−14 28.1	101 50.6	−11 03.7	316 53.5	+20 39.4	213 51.9	−14 36.4	2 40.0	19	+24 28.7	+ 4
	1	93 13.7	230 05.9	27.9	116 51.4	03.0	331 56.1	39.4	228 54.1	36.4	17 00.9	20	24 29.1	+ 2
	2	108 16.2	245 07.9	27.6	131 52.2	02.2	346 58.8	39.5	243 56.3	36.5	31 21.9	20	24 29.3	0
	3	123 18.6	260 09.8	•• 27.3	146 53.0	•• 01.5	2 01.4	•• 39.5	258 58.5	•• 36.6	45 42.9	20	·24 29.3	− 2
	4	138 21.1	275 11.8	27.1	161 53.8	00.8	17 04.1	39.5	274 00.6	36.6	60 03.9	21	24 29.1	− 3
	5	153 23.6	290 13.7	26.8	176 54.6	11 00.1	32 06.7	39.6	289 02.8	36.7	74 25.0	21	24 28.8	− 6
	6	168 26.0	305 15.6	−14 26.6	191 55.4	−10 59.4	47 09.4	+20 39.6	304 05.0	−14 36.8	88 46.1	21	+24 28.2	− 7
	7	183 28.5	320 17.5	26.3	206 56.2	58.7	62 12.1	39.7	319 07.2	36.9	103 07.2	21	24 27.5	− 10
	8	198 31.0	335 19.5	26.0	221 57.0	58.0	77 14.7	39.7	334 09.4	36.9	117 28.3	21	24 26.5	− 11
	9	213 33.4	350 21.4	•• 25.8	236 57.8	•• 57.3	92 17.4	•• 39.8	349 11.6	•• 37.0	131 49.4	22	·24 25.4	− 13
	10	228 35.9	5 23.3	25.5	251 58.6	56.6	107 20.0	39.8	4 13.8	37.1	146 10.6	23	24 24.1	− 15
	11	243 38.4	20 25.2	25.3	266 59.4	55.9	122 22.7	39.9	19 16.0	37.2	160 31.9	23	24 22.6	− 17
	12	258 40.8	35 27.1	−14 25.0	282 00.2	−10 55.2	137 25.3	+20 39.9	34 18.2	−14 37.2	174 53.2	23	+24 20.9	− 18
	13	273 43.3	50 29.0	24.8	297 00.9	54.5	152 28.0	40.0	49 20.4	37.3	189 14.5	24	24 19.1	− 21
	14	288 45.8	65 30.9	24.5	312 01.7	53.8	167 30.7	40.0	64 22.6	37.4	203 35.9	24	24 17.0	− 22
	15	303 48.2	80 32.8	•• 24.3	327 02.5	•• 53.0	182 33.3	•• 40.0	79 24.8	•• 37.5	217 57.3	25	·24 14.8	− 24
	16	318 50.7	95 34.7	24.0	342 03.3	52.3	197 36.0	40.1	94 27.0	37.5	232 18.8	25	24 12.4	− 26
	17	333 53.1	110 36.6	23.8	357 04.1	51.6	212 38.6	40.1	109 29.2	37.6	246 40.3	26	24 09.8	− 28
	18	348 55.6	125 38.5	−14 23.6	12 04.9	−10 50.9	227 41.3	+20 40.2	124 31.4	−14 37.7	261 01.9	27	+24 07.0	− 29
	19	3 58.1	140 40.4	23.3	27 05.7	50.2	242 44.0	40.2	139 33.6	37.8	275 23.6	27	24 04.1	− 32
	20	19 00.5	155 42.3	23.1	42 06.5	49.5	257 46.6	40.3	154 35.8	37.8	289 45.3	27	24 00.9	− 33
	21	34 03.0	170 44.1	•• 22.9	57 07.3	•• 48.8	272 49.3	•• 40.3	169 38.0	•• 37.9	304 07.0	29	·23 57.6	− 34
	22	49 05.5	185 46.0	22.6	72 08.1	48.1	287 52.0	40.4	184 40.2	38.0	318 28.9	29	23 54.2	− 37
	23	64 07.9	200 47.9	22.4	87 08.9	47.4	302 54.6	40.4	199 42.4	38.0	332 50.8	30	23 50.5	− 38
11	0	79 10.4	215 49.7	−14 22.2	102 09.7	−10 46.7	317 57.3	+20 40.5	214 44.6	−14 38.1	347 12.8	31	+23 46.7	− 40
	1	94 12.9	230 51.6	21.9	117 10.5	46.0	332 59.9	40.5	229 46.8	38.2	1 34.9	31	23 42.7	− 42
	2	109 15.3	245 53.5	21.7	132 11.3	45.2	348 02.6	40.6	244 49.0	38.3	15 57.0	32	23 38.5	− 43
	3	124 17.8	260 55.3	•• 21.5	147 12.1	•• 44.5	3 05.3	•• 40.6	259 51.1	•• 38.3	30 19.2	33	·23 34.2	− 45
	4	139 20.3	275 57.2	21.3	162 12.9	43.8	18 07.9	40.7	274 53.3	38.4	44 41.5	34	23 29.7	− 47
	5	154 22.7	290 59.0	21.1	177 13.7	43.1	33 10.6	40.7	289 55.5	38.5	59 03.9	35	23 25.0	− 49
	6	169 25.2	306 00.8	−14 20.8	192 14.5	−10 42.4	48 13.3	+20 40.7	304 57.7	−14 38.6	73 26.4	36	+23 20.1	− 50
	7	184 27.6	321 02.7	20.6	207 15.3	41.7	63 15.9	40.8	319 59.9	38.6	87 49.0	36	23 15.1	− 51
	8	199 30.1	336 04.5	20.4	222 16.1	41.0	78 18.6	40.8	335 02.1	38.7	102 11.6	37	23 10.0	− 54
	9	214 32.6	351 06.4	•• 20.2	237 16.9	•• 40.3	93 21.2	•• 40.9	350 04.3	•• 38.8	116 34.3	39	·23 04.6	− 55
	10	229 35.0	6 08.2	20.0	252 17.7	39.6	108 23.9	40.9	5 06.5	38.8	130 57.2	39	22 59.1	− 56
	11	244 37.5	21 10.0	19.8	267 18.5	38.9	123 26.6	41.0	20 08.7	38.9	145 20.1	40	22 53.5	− 58
	12	259 40.0	36 11.8	−14 19.6	282 19.3	−10 38.1	138 29.2	+20 41.0	35 10.9	−14 39.0	159 43.1	41	+22 47.7	− 60
	13	274 42.4	51 13.7	19.4	297 20.1	37.4	153 31.9	41.1	50 13.1	39.1	174 06.2	42	22 41.7	− 61
	14	289 44.9	66 15.5	19.2	312 20.9	36.7	168 34.6	41.1	65 15.3	39.1	188 29.4	44	22 35.6	− 63
	15	304 47.4	81 17.3	•• 19.0	327 21.7	•• 36.0	183 37.2	•• 41.2	80 17.5	•• 39.2	202 52.8	44	·22 29.3	− 64
	16	319 49.8	96 19.1	18.8	342 22.5	35.3	198 39.9	41.2	95 19.7	39.3	217 16.2	45	22 22.9	− 65
	17	334 52.3	111 20.9	18.6	357 23.3	34.6	213 42.6	41.3	110 21.9	39.4	231 39.7	46	22 16.4	− 68
	18	349 54.8	126 22.7	−14 18.4	12 24.1	−10 33.9	228 45.3	+20 41.3	125 24.1	−14 39.4	246 03.3	48	+22 09.6	− 68
	19	4 57.2	141 24.5	18.2	27 24.9	33.2	243 47.9	41.4	140 26.3	39.5	260 27.1	48	22 02.8	− 70
	20	19 59.7	156 26.3	18.0	42 25.7	32.4	258 50.6	41.4	155 28.5	39.6	274 50.9	49	21 55.8	− 72
	21	35 02.1	171 28.1	•• 17.8	57 26.5	•• 31.7	273 53.3	•• 41.5	170 30.7	•• 39.6	289 14.8	51	·21 48.6	− 72
	22	50 04.6	186 29.9	17.6	72 27.3	31.0	288 55.9	41.5	185 32.9	39.7	303 38.9	51	21 41.4	− 75
	23	65 07.1	201 31.7	17.4	87 28.1	30.3	303 58.6	41.5	200 35.1	39.8	318 03.0	53	21 33.9	− 75
	24	80 09.5	216 33.4	−14 17.3	102 28.9	−10 29.6	319 01.3	+20 41.6	215 37.3	−14 39.9	332 27.3	54	+21 26.4	− 77
	code	—	+ 19	+ 2	+ 7	+ 7	+ 27	+ 1	+ 22	− 1				

GMT		SUN GHA	SUN Dec.
	h	° ′	° ′
9	0	181 59.9	−22 44.9
	1	196 59.6	45.1
	2	211 59.3	45.4
	3	226 59.1 ••	45.6
	4	241 58.8	45.9
	5	256 58.5	46.2
	6	271 58.2	−22 46.4
	7	286 58.0	46.7
	8	301 57.7	46.9
	9	316 57.4 ••	47.2
	10	331 57.1	47.4
	11	346 56.9	47.7
	12	1 56.6	−22 47.9
	13	16 56.3	48.2
	14	31 56.0	48.4
	15	46 55.7 ••	48.7
	16	61 55.5	48.9
	17	76 55.2	49.1
	18	91 54.9	−22 49.4
	19	106 54.6	49.6
	20	121 54.4	49.9
	21	136 54.1 ••	50.1
	22	151 53.8	50.4
	23	166 53.5	50.6
10	0	181 53.2	−22 50.8
	1	196 53.0	51.1
	2	211 52.7	51.3
	3	226 52.4 ••	51.6
	4	241 52.1	51.8
	5	256 51.8	52.0
	6	271 51.6	−22 52.3
	7	286 51.3	52.5
	8	301 51.0	52.7
	9	316 50.7 ••	53.0
	10	331 50.4	53.2
	11	346 50.2	53.4
	12	1 49.9	−22 53.7
	13	16 49.6	53.9
	14	31 49.3	54.1
	15	46 49.0 ••	54.3
	16	61 48.7	54.6
	17	76 48.5	54.8
	18	91 48.2	−22 55.0
	19	106 47.9	55.2
	20	121 47.6	55.5
	21	136 47.3 ••	55.7
	22	151 47.1	55.9
	23	166 46.8	56.1
11	0	181 46.5	−22 56.4
	1	196 46.2	56.6
	2	211 45.9	56.8
	3	226 45.6 ••	57.0
	4	241 45.3	57.2
	5	256 45.1	57.5
	6	271 44.8	−22 57.7
	7	286 44.5	57.9
	8	301 44.2	58.1
	9	316 43.9 ••	58.3
	10	331 43.6	58.5
	11	346 43.3	58.7
	12	1 43.1	−22 59.0
	13	16 42.8	59.2
	14	31 42.5	59.4
	15	46 42.2 ••	59.6
	16	61 41.9	22 59.8
	17	76 41.6	23 00.0
	18	91 41.3	−23 00.2
	19	106 41.1	00.4
	20	121 40.8	00.6
	21	136 40.5 ••	00.8
	22	151 40.2	01.0
	23	166 39.9	01.2
	24	181 39.6	−23 01.4
code		—	− 2

STARS No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.2	−40 29.1
5	Achernar	335 58.9	−57 28.0
30	Acrux	173 58.8	−62 50.8
19	Adhara	255 46.6	−28 54.5
10	Aldebaran	291 39.4	+16 25.3
32	Alioth	166 59.2	+56 11.9
34	Alkaid	153 33.6	+49 32.0
55	Al Na'ir	28 38.8	−47 10.9
15	Alnilam	276 30.5	− 1 13.7
25	Alphard	218 39.0	− 8 27.7
41	Alphecca	126 48.5	+26 51.8
1	Alpheratz	358 28.9	+28 50.8
51	Altair	62 51.3	+ 8 45.0
2	Ankaa	353 58.7	−42 33.1
42	Antares	113 20.5	−26 20.0
37	Arcturus	146 36.0	+19 24.8
43	Atria	109 02.3	−68 56.9
22	Avior	234 35.6	−59 21.7
13	Bellatrix	279 18.7	+ 6 18.7
16	Betelg'se	271 48.4	+ 7 24.1
17	Canopus	264 15.1	−52 40.1
12	Capella	281 38.8	+45 57.3
53	Deneb	50 01.7	+45 07.4
28	Denebola	183 18.4	+14 49.3
4	Diphda	349 39.7	−18 14.0
27	Dubhe	194 45.2	+61 59.3
14	Elnath	279 07.7	+28 34.3
47	Eltanin	91 07.1	+51 29.7
54	Enif	34 30.3	+ 9 40.2
56	Fomalhaut	16 12.3	−29 51.7
31	Gacrux	172 50.2	−56 51.5
29	Gienah	176 37.6	−17 17.5
35	Hadar	149 50.8	−60 09.3
6	Hamal	328 50.1	+23 15.2
48	Kaus Aust.	84 42.4	−34 24.5
40	Kochab	137 18.8	+74 20.1
57	Markab	14 22.1	+14 58.0
8	Menkar	315 00.6	+ 3 55.0
36	Menkent	148 59.7	−36 08.9
24	Miapl'dus	221 48.7	−69 31.7
9	Mirfak	309 42.8	+49 42.4
50	Nunki	76 53.0	−26 21.3
52	Peacock	54 28.6	−56 53.0
21	Pollux	244 21.0	+28 08.1
20	Procyon	245 45.3	+ 5 20.5
46	R'alhague	96 47.5	+12 35.5
26	Regulus	208 30.0	+12 11.2
11	Rigel	281 53.9	− 8 15.1
38	Rigil Kent.	140 52.4	−60 39.0
44	Sabik	103 03.2	−15 40.3
3	Schedar	350 30.5	+56 17.8
45	Shaula	97 21.9	−37 04.4
18	Sirius	259 12.0	−16 39.1
33	Spica	159 17.7	−10 55.6
23	Suhail	223 24.5	−43 14.8
49	Vega	81 09.1	+38 44.5
39	Zub'g'bi	137 54.3	−15 51.3

Lat.	Sunrise	Twlt. begins	Moonrise 9	Moonrise 10	Moonrise 11	Moonrise 12
N °	h m	h m	h m	h m	h m	h m
72	■	6 40	□	□	□	□
70	■	6 33	□	□	□	15 41
68	■	6 25	□	□	□	16 37
66	10 14	6 20	11 30	□	14 59	17 11
64	9 37	6 15	12 56	13 59	15 42	17 35
62	9 11	6 10	13 34	14 38	16 11	17 54
60	8 50	6 06	14 01	15 06	16 33	18 09
58	8 33	6 01	14 22	15 27	16 51	18 22
56	8 19	5 57	14 39	15 45	17 06	18 34
54	8 07	5 54	14 54	16 00	17 19	18 44
52	7 57	5 50	15 07	16 12	17 30	18 52
50	7 47	5 48	15 18	16 24	17 40	19 00
45	7 27	5 40	15 42	16 47	18 01	19 17
40	7 11	5 33	16 01	17 06	18 18	19 31
35	6 57	5 26	16 17	17 22	18 32	19 42
30	6 45	5 19	16 30	17 36	18 44	19 52
20	6 24	5 05	16 54	17 59	19 05	20 09
10	6 06	4 50	17 14	18 19	19 24	20 24
0	5 49	4 34	17 33	18 38	19 41	20 38
10	5 32	4 14	17 53	18 57	19 58	20 52
20	5 13	3 49	18 13	19 17	20 16	21 07
30	4 52	3 16	18 37	19 41	20 36	21 24
35	4 39	2 53	18 51	19 54	20 49	21 34
40	4 24	2 23	19 07	20 10	21 03	21 45
45	4 07	1 38	19 27	20 29	21 19	21 58
50	3 45	////	19 51	20 53	21 39	22 14
52	3 35	////	20 03	21 04	21 49	22 22
54	3 23	////	20 16	21 16	22 00	22 30
56	3 09	////	20 32	21 31	22 12	22 39
58	2 53	////	20 50	21 48	22 26	22 49
60	2 34	////	21 12	22 09	22 42	23 01
S						

Lat.	Sunset	Twlt. ends	Moonset 9	Moonset 10	Moonset 11	Moonset 12
N °	h m	h m	h m	h m	h m	h m
72	■	17 02	□	□	□	□
70	■	17 10	□	□	□	13 23
68	■	17 17	□	□	□	12 25
66	13 31	17 24	10 57	□	11 59	11 51
64	14 08	17 29	9 32	10 46	11 15	11 26
62	14 34	17 34	8 55	10 07	10 46	11 06
60	14 55	17 39	8 28	9 39	10 24	10 50
58	15 12	17 43	8 07	9 18	10 06	10 36
56	15 26	17 47	7 50	9 00	9 50	10 24
54	15 38	17 50	7 36	8 45	9 37	10 13
52	15 49	17 54	7 23	8 32	9 25	10 04
50	15 58	17 57	7 12	8 21	9 15	9 55
45	16 18	18 04	6 49	7 57	8 53	9 38
40	16 35	18 12	6 30	7 38	8 36	9 23
35	16 49	18 19	6 14	7 22	8 21	9 11
30	17 01	18 26	6 01	7 08	8 08	9 00
20	17 21	18 39	5 38	6 44	7 46	8 41
10	17 39	18 54	5 18	6 24	7 26	8 24
0	17 56	19 11	4 59	6 04	7 08	8 09
10	18 13	19 30	4 41	5 45	6 50	7 53
20	18 32	19 56	4 21	5 24	6 31	7 36
30	18 53	20 29	3 58	5 01	6 08	7 17
35	19 06	20 52	3 44	4 46	5 55	7 05
40	19 21	21 23	3 29	4 30	5 39	6 52
45	19 38	22 08	3 10	4 11	5 21	6 37
50	20 00	////	2 47	3 46	4 58	6 17
52	20 11	////	2 36	3 34	4 47	6 08
54	20 23	////	2 24	3 21	4 35	5 58
56	20 36	////	2 10	3 06	4 20	5 46
58	20 52	////	1 53	2 47	4 03	5 33
60	21 12	////	1 33	2 25	3 43	5 17
S						

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.6	0.4	0.1
30			
	0.6	0.3	0.1
45			
	0.6	0.3	0.1
60			
	0.6	0.2	0.0
75			
	0.6	0.1	0.0
90			

Moon's Lower Limb Add

Alt.	9	10	11
°	′	′	′
0			
	20.9	20.5	19.7
4			
	20.9	20.5	19.7
8			
	20.8	20.5	19.7
12			
	20.8	20.4	19.7
16			
	20.7	20.3	19.6
20			
	20.6	20.2	19.5
24			
	20.5	20.1	19.4
28			
	20.3	20.0	19.3
32			
	20.2	19.8	19.2
36			
	20.0	19.7	19.1
40			
	19.8	19.5	18.9
44			
	19.6	19.3	18.7
48			
	19.4	19.1	18.6
52			
	19.2	18.9	18.4
56			
	18.9	18.7	18.2
60			
	18.7	18.4	18.0
64			
	18.4	18.2	17.8
68			
	18.1	17.9	17.6
72			
	17.9	17.7	17.4
76			
	17.6	17.4	17.1
80			
	17.3	17.2	16.9
84			
	17.0	16.9	16.7
88			
	16.8	16.7	16.5
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	9	10	11
°	′	′	′
0			
	12.5	12.7	13.2
4			
	12.5	12.7	13.2
8			
	12.6	12.8	13.2
12			
	12.6	12.8	13.2
16			
	12.7	12.9	13.3
20			
	12.8	13.0	13.4
24			
	12.9	13.1	13.5
28			
	13.1	13.2	13.6
32			
	13.2	13.4	13.7
36			
	13.4	13.5	13.8
40			
	13.6	13.7	14.0
44			
	13.8	13.9	14.2
48			
	14.0	14.1	14.3
52			
	14.2	14.3	14.5
56			
	14.5	14.5	14.7
60			
	14.7	14.8	14.9
64			
	15.0	15.0	15.1
68			
	15.3	15.3	15.3
72			
	15.5	15.5	15.5
76			
	15.8	15.8	15.8
80			
	16.1	16.1	16.0
84			
	16.4	16.3	16.2
88			
	16.6	16.5	16.4
90			

Subtract from table, back cover

Equation of Time (App.—Mean)

GMT	9	10	11
h	m s	m s	m s
0	+ 8 00.1	+ 7 33.5	+ 7 06.5
6	+ 7 53.5	+ 7 26.8	+ 6 59.7
12	+ 7 46.9	+ 7 20.1	+ 6 52.8
18	+ 7 40.2	+ 7 13.3	+ 6 46.0
24	+ 7 33.5	+ 7 06.5	+ 6 39.1

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
9	23 49	9 42	17 13	2 56	9 47
10	24 53	9 39	17 12	2 52	9 43
11	0 53	9 36	17 10	2 48	9 40
12	1 55	9 33	17 09	2 43	9 36

Full Moon 10

GMT		♈ GHA	VENUS −4.3 GHA	Dec.	MARS 0.6 GHA	Dec.	JUPITER −2.1 GHA	Dec.	SATURN 0.8 GHA	Dec.	MOON GHA	code	Dec.	code
	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
12	0	80 09.5	216 33.4	−14 17.3	102 28.9	−10 29.6	319 01.3	+20 41.6	215 37.3	−14 39.9	332 27.3	54	+21 26.4	−77
	1	95 12.0	231 35.2	17.1	117 29.7	28.9	334 03.9	41.6	230 39.5	39.9	346 51.7	55	21 18.7	−79
	2	110 14.5	246 37.0	16.9	132 30.5	28.2	349 06.6	41.7	245 41.7	40.0	1 16.2	56	21 10.8	−79
	3	125 16.9	261 38.8	·· 16.7	147 31.3	·· 27.5	4 09.3	·· 41.7	260 43.9	·· 40.1	15 40.8	57	·21 02.9	−81
	4	140 19.4	276 40.5	16.5	162 32.1	26.7	19 11.9	41.8	275 46.1	40.2	30 05.5	59	20 54.8	−82
	5	155 21.9	291 42.3	16.4	177 32.9	26.0	34 14.6	41.8	290 48.3	40.2	44 30.4	59	20 46.6	−84
	6	170 24.3	306 44.0	−14 16.2	192 33.7	−10 25.3	49 17.3	+20 41.9	305 50.5	−14 40.3	58 55.3	61	+20 38.2	−84
	7	185 26.8	321 45.8	16.0	207 34.5	24.6	64 20.0	41.9	320 52.7	40.4	73 20.4	62	20 29.8	−86
	8	200 29.2	336 47.6	15.8	222 35.3	23.9	79 22.6	42.0	335 54.9	40.4	87 45.6	63	20 21.2	−87
	9	215 31.7	351 49.3	·· 15.7	237 36.1	·· 23.2	94 25.3	·· 42.0	350 57.1	·· 40.5	102 10.9	64	·20 12.5	−89
	10	230 34.2	6 51.1	15.5	252 36.9	22.5	109 28.0	42.1	5 59.3	40.6	116 36.3	65	20 03.6	−89
	11	245 36.6	21 52.8	15.3	267 37.7	21.8	124 30.7	42.1	21 01.5	40.7	131 01.8	67	19 54.7	−91
	12	260 39.1	36 54.5	−14 15.2	282 38.5	−10 21.0	139 33.3	+20 42.2	36 03.7	−14 40.7	145 27.5	68	+19 45.6	−92
	13	275 41.6	51 56.3	15.0	297 39.3	20.3	154 36.0	42.2	51 05.9	40.8	159 53.3	69	19 36.4	−92
	14	290 44.0	66 58.0	14.9	312 40.1	19.6	169 38.7	42.3	66 08.1	40.9	174 19.2	70	19 27.2	−94
	15	305 46.5	81 59.7	·· 14.7	327 40.9	·· 18.9	184 41.4	·· 42.3	81 10.3	·· 41.0	188 45.2	71	·19 17.8	−95
	16	320 49.0	97 01.5	14.5	342 41.7	18.2	199 44.0	42.4	96 12.5	41.0	203 11.3	73	19 08.3	−96
	17	335 51.4	112 03.2	14.4	357 42.5	17.5	214 46.7	42.4	111 14.7	41.1	217 37.6	73	18 58.7	−98
	18	350 53.9	127 04.9	−14 14.2	12 43.3	−10 16.7	229 49.4	+20 42.5	126 16.9	−14 41.2	232 03.9	75	+18 48.9	−98
	19	5 56.4	142 06.6	14.1	27 44.1	16.0	244 52.1	42.5	141 19.1	41.2	246 30.4	76	18 39.1	−99
	20	20 58.8	157 08.3	13.9	42 44.9	15.3	259 54.7	42.6	156 21.3	41.3	260 57.0	77	18 29.2	−100
	21	36 01.3	172 10.0	·· 13.8	57 45.7	·· 14.6	274 57.4	·· 42.6	171 23.5	·· 41.4	275 23.7	79	·18 19.2	−101
	22	51 03.7	187 11.7	13.6	72 46.5	13.9	290 00.1	42.7	186 25.7	41.5	289 50.6	79	18 09.1	−102
	23	66 06.2	202 13.4	13.5	87 47.3	13.2	305 02.8	42.7	201 27.9	41.5	304 17.5	81	17 58.9	−103
13	0	81 08.7	217 15.1	−14 13.4	102 48.1	−10 12.5	320 05.4	+20 42.8	216 30.1	−14 41.6	318 44.6	82	+17 48.6	−104
	1	96 11.1	232 16.8	13.2	117 48.9	11.7	335 08.1	42.8	231 32.3	41.7	333 11.8	83	17 38.2	−105
	2	111 13.6	247 18.5	13.1	132 49.7	11.0	350 10.8	42.9	246 34.5	41.7	347 39.1	85	17 27.7	−106
	3	126 16.1	262 20.2	·· 12.9	147 50.5	·· 10.3	5 13.5	·· 42.9	261 36.7	·· 41.8	2 06.6	85	·17 17.1	−106
	4	141 18.5	277 21.9	12.8	162 51.3	09.6	20 16.1	43.0	276 38.9	41.9	16 34.1	87	17 06.5	−108
	5	156 21.0	292 23.6	12.7	177 52.1	08.9	35 18.8	43.0	291 41.1	42.0	31 01.8	87	16 55.7	−108
	6	171 23.5	307 25.3	−14 12.5	192 52.9	−10 08.2	50 21.5	+20 43.1	306 43.3	−14 42.0	45 29.5	89	+16 44.9	−109
	7	186 25.9	322 26.9	12.4	207 53.7	07.4	65 24.2	43.1	321 45.5	42.1	59 57.4	91	16 34.0	−110
	8	201 28.4	337 28.6	12.3	222 54.5	06.7	80 26.9	43.2	336 47.6	42.2	74 25.5	91	16 23.0	−110
	9	216 30.9	352 30.3	·· 12.2	237 55.3	·· 06.0	95 29.5	·· 43.2	351 49.8	·· 42.2	88 53.6	92	·16 12.0	−111
	10	231 33.3	7 32.0	12.0	252 56.1	05.3	110 32.2	43.3	6 52.0	42.3	103 21.8	94	16 00.9	−113
	11	246 35.8	22 33.6	11.9	267 56.9	04.6	125 34.9	43.3	21 54.3	42.4	117 50.2	94	15 49.6	−112
	12	261 38.2	37 35.3	−14 11.8	282 57.7	−10 03.9	140 37.6	+20 43.4	36 56.5	−14 42.5	132 18.6	96	+15 38.4	−114
	13	276 40.7	52 36.9	11.7	297 58.5	03.1	155 40.3	43.4	51 58.7	42.5	146 47.2	97	15 27.0	−114
	14	291 43.2	67 38.6	11.5	312 59.3	02.4	170 43.0	43.5	67 00.9	42.6	161 15.9	98	15 15.6	−115
	15	306 45.6	82 40.2	·· 11.4	328 00.1	·· 01.7	185 45.6	·· 43.5	82 03.1	·· 42.7	175 44.7	99	·15 04.1	−115
	16	321 48.1	97 41.9	11.3	343 00.9	01.0	200 48.3	43.6	97 05.3	42.7	190 13.6	100	14 52.6	−117
	17	336 50.6	112 43.5	11.2	358 01.7	10 00.3	215 51.0	43.6	112 07.5	42.8	204 42.6	101	14 40.9	−116
	18	351 53.0	127 45.2	−14 11.1	13 02.5	− 9 59.6	230 53.7	+20 43.7	127 09.7	−14 42.9	219 11.7	103	+14 29.3	−118
	19	6 55.5	142 46.8	11.0	28 03.3	58.8	245 56.4	43.7	142 11.9	43.0	233 41.0	103	14 17.5	−118
	20	21 58.0	157 48.4	10.9	43 04.1	58.1	260 59.0	43.8	157 14.1	43.0	248 10.3	104	14 05.7	−118
	21	37 00.4	172 50.1	·· 10.8	58 04.9	·· 57.4	276 01.7	·· 43.8	172 16.3	·· 43.1	262 39.7	106	·13 53.9	−120
	22	52 02.9	187 51.7	10.7	73 05.7	56.7	291 04.4	43.9	187 18.5	43.2	277 09.3	106	13 41.9	−119
	23	67 05.4	202 53.3	10.6	88 06.5	56.0	306 07.1	43.9	202 20.7	43.2	291 38.9	108	13 30.0	−120
14	0	82 07.8	217 54.9	−14 10.5	103 07.3	− 9 55.2	321 09.8	+20 44.0	217 22.9	−14 43.3	306 08.7	108	+13 18.0	−121
	1	97 10.3	232 56.6	10.4	118 08.1	54.5	336 12.5	44.0	232 25.1	43.4	320 38.5	110	13 05.9	−121
	2	112 12.7	247 58.2	10.3	133 08.9	53.8	351 15.2	44.1	247 27.3	43.4	335 08.5	111	12 53.8	−122
	3	127 15.2	262 59.8	·· 10.2	148 09.7	·· 53.1	6 17.8	·· 44.1	262 29.5	·· 43.5	349 38.6	111	·12 41.6	−122
	4	142 17.7	278 01.4	10.1	163 10.5	52.4	21 20.5	44.2	277 31.7	43.6	4 08.7	113	12 29.4	−123
	5	157 20.1	293 03.0	10.0	178 11.3	51.6	36 23.2	44.2	292 33.9	43.7	18 39.0	113	12 17.1	−123
	6	172 22.6	308 04.6	−14 09.9	193 12.1	− 9 50.9	51 25.9	+20 44.3	307 36.1	−14 43.7	33 09.3	115	+12 04.8	−124
	7	187 25.1	323 06.2	09.8	208 12.9	50.2	66 28.6	44.3	322 38.3	43.8	47 39.8	115	11 52.4	−124
	8	202 27.5	338 07.8	09.7	223 13.7	49.5	81 31.3	44.4	337 40.5	43.9	62 10.3	117	11 40.0	−124
	9	217 30.0	353 09.4	·· 09.6	238 14.5	·· 48.8	96 34.0	·· 44.4	352 42.7	·· 43.9	76 41.0	117	·11 27.6	−125
	10	232 32.5	8 11.0	09.5	253 15.3	48.0	111 36.6	44.5	7 44.9	44.0	91 11.7	118	11 15.1	−125
	11	247 34.9	23 12.5	09.4	268 16.1	47.3	126 39.3	44.5	22 47.1	44.1	105 42.5	119	11 02.6	−125
	12	262 37.4	38 14.1	−14 09.4	283 16.9	− 9 46.6	141 42.0	+20 44.6	37 49.3	−14 44.2	120 13.4	120	+10 50.1	−126
	13	277 39.8	53 15.7	09.3	298 17.7	45.9	156 44.7	44.6	52 51.5	44.2	134 44.4	121	10 37.5	−126
	14	292 42.3	68 17.3	09.2	313 18.5	45.2	171 47.4	44.7	67 53.7	44.3	149 15.5	122	10 24.9	−127
	15	307 44.8	83 18.8	·· 09.1	328 19.3	·· 44.4	186 50.1	·· 44.7	82 55.9	·· 44.4	163 46.7	123	·10 12.2	−127
	16	322 47.2	98 20.4	09.1	343 20.1	43.7	201 52.8	44.8	97 58.1	44.4	178 18.0	123	9 59.5	−127
	17	337 49.7	113 22.0	09.0	358 20.9	43.0	216 55.5	44.8	113 00.3	44.5	192 49.3	125	9 46.8	−127
	18	352 52.2	128 23.5	−14 08.9	13 21.8	− 9 42.3	231 58.2	+20 44.9	128 02.5	−14 44.6	207 20.8	125	+ 9 34.1	−128
	19	7 54.6	143 25.1	08.8	28 22.6	41.6	247 00.9	44.9	143 04.7	44.7	221 52.3	126	9 21.3	−128
	20	22 57.1	158 26.7	08.8	43 23.4	40.8	262 03.5	45.0	158 06.9	44.7	236 23.9	127	9 08.5	−128
	21	37 59.6	173 28.2	·· 08.7	58 24.2	·· 40.1	277 06.2	·· 45.0	173 09.1	·· 44.8	250 55.6	128	· 8 55.7	−129
	22	53 02.0	188 29.8	08.6	73 25.0	39.4	292 08.9	45.1	188 11.3	44.9	265 27.4	128	8 42.8	−128
	23	68 04.5	203 31.3	08.6	88 25.8	38.7	307 11.6	45.1	203 13.5	44.9	279 59.2	129	8 30.0	−129
	24	83 07.0	218 32.9	−14 08.5	103 26.6	− 9 38.0	322 14.3	+20 45.2	218 15.7	−14 45.0	294 31.1	130	+ 8 17.1	−129
code		—	+ 16	+ 1	+ 8	+ 8	+ 27	[illegible]	+ 22	0				

G M T		SUN GHA	SUN Dec.
	h	° ′	° ′
12	0	181 39.6	−23 01.4
	1	196 39.3	01.6
	2	211 39.0	01.8
	3	226 38.8	·· 02.0
	4	241 38.5	02.2
	5	256 38.2	02.4
	6	271 37.9	−23 02.6
	7	286 37.6	02.8
	8	301 37.3	03.0
	9	316 37.0	·· 03.2
	10	331 36.7	03.4
	11	346 36.4	03.6
	12	1 36.2	−23 03.8
	13	16 35.9	04.0
	14	31 35.6	04.2
	15	46 35.3	·· 04.4
	16	61 35.0	04.6
	17	76 34.7	04.7
	18	91 34.4	−23 04.9
	19	106 34.1	05.1
	20	121 33.8	05.3
	21	136 33.5	·· 05.5
	22	151 33.2	05.7
	23	166 33.0	05.9
13	0	181 32.7	−23 06.0
	1	196 32.4	06.2
	2	211 32.1	06.4
	3	226 31.8	·· 06.6
	4	241 31.5	06.8
	5	256 31.2	06.9
	6	271 30.9	−23 07.1
	7	286 30.6	07.3
	8	301 30.3	07.5
	9	316 30.0	·· 07.7
	10	331 29.7	07.8
	11	346 29.4	08.0
	12	1 29.1	−23 08.2
	13	16 28.9	08.3
	14	31 28.6	08.5
	15	46 28.3	·· 08.7
	16	61 28.0	08.9
	17	76 27.7	09.0
	18	91 27.4	−23 09.2
	19	106 27.1	09.4
	20	121 26.8	09.5
	21	136 26.5	·· 09.7
	22	151 26.2	09.9
	23	166 25.9	10.0
14	0	181 25.6	−23 10.2
	1	196 25.3	10.4
	2	211 25.0	10.5
	3	226 24.7	·· 10.7
	4	241 24.4	10.8
	5	256 24.1	11.0
	6	271 23.8	−23 11.2
	7	286 23.5	11.3
	8	301 23.2	11.5
	9	316 22.9	·· 11.6
	10	331 22.7	11.8
	11	346 22.4	11.9
	12	1 22.1	−23 12.1
	13	16 21.8	12.3
	14	31 21.5	12.4
	15	46 21.2	·· 12.6
	16	61 20.9	12.7
	17	76 20.6	12.9
	18	91 20.3	−23 13.0
	19	106 20.0	13.2
	20	121 19.7	13.3
	21	136 19.4	·· 13.5
	22	151 19.1	13.6
	23	166 18.8	13.7
	24	181 18.5	−23 13.9
code		—	− 1

STARS

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.2	−40 29.1
5	Achernar	335 58.9	−57 28.0
30	Acrux	173 58.7	−62 50.8
19	Adhara	255 46.6	−28 54.5
10	Aldebaran	291 39.4	+16 25.3
32	Alioth	166 59.2	+56 11.9
34	Alkaid	153 33.6	+49 32.0
55	Al Na'ir	28 38.8	−47 10.9
15	Alnilam	276 30.5	− 1 13.7
25	Alphard	218 39.0	− 8 27.8
41	Alphecca	126 48.4	+26 51.8
1	Alpheratz	358 28.9	+28 50.8
51	Altair	62 51.3	+ 8 45.0
2	Ankaa	353 58.7	−42 33.1
42	Antares	113 20.5	−26 20.0
37	Arcturus	146 35.9	+19 24.8
43	Atria	109 02.3	−68 56.9
22	Avior	234 35.6	−59 21.7
13	Bellatrix	279 18.7	+ 6 18.7
16	Betelg'se	271 48.4	+ 7 24.1
17	Canopus	264 15.1	−52 40.1
12	Capella	281 38.8	+45 57.3
53	Deneb	50 01.7	+45 07.4
28	Denebola	183 18.3	+14 49.3
4	Diphda	349 39.7	−18 14.0
27	Dubhe	194 45.1	+61 59.3
14	Elnath	279 07.7	+28 34.3
47	Eltanin	91 07.1	+51 29.6
54	Enif	34 30.3	+ 9 40.2
56	Fomalhaut	16 12.3	−29 51.7
31	Gacrux	172 50.1	−56 51.5
29	Gienah	176 37.5	−17 17.5
35	Hadar	149 50.7	−60 09.3
6	Hamal	328 50.1	+23 15.2
48	Kaus Aust.	84 42.3	−34 24.5
40	Kochab	137 18.8	+74 20.1
57	Markab	14 22.1	+14 58.0
8	Menkar	315 00.6	+ 3 55.0
36	Menkent	148 59.6	−36 08.9
24	Miapl'dus	221 48.7	−69 31.7
9	Mirfak	309 42.8	+49 42.4
50	Nunki	76 53.0	−26 21.3
52	Peacock	54 28.6	−56 53.0
21	Pollux	244 21.0	+28 08.1
20	Procyon	245 45.3	+ 5 20.5
46	R'alhague	96 47.5	+12 35.5
26	Regulus	208 30.0	+12 11.2
11	Rigel	281 53.8	− 8 15.1
38	Rigil Kent.	140 52.3	−60 39.0
44	Sabik	103 03.2	−15 40.3
3	Schedar	350 30.5	+56 17.8
45	Shaula	97 21.9	−37 04.4
18	Sirius	259 12.0	−16 39.1
33	Spica	159 17.7	−10 55.6
23	Suhail	223 24.5	−43 14.9
49	Vega	81 09.1	+38 44.5
39	Zub'g'bi	137 54.3	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 12	Moonrise 13	Moonrise 14	Moonrise 15
N °	h m	h m	h m	h m	h m	h m
72	■	6 45	□	17 55	20 19	22 22
70	■	6 36	15 41	18 27	20 34	22 26
68	■	6 29	16 37	18 50	20 45	22 30
66	10 22	6 24	17 11	19 08	20 55	22 34
64	9 42	6 18	17 35	19 22	21 03	22 36
62	9 15	6 13	17 54	19 34	21 09	22 39
60	8 54	6 08	18 09	19 45	21 15	22 41
58	8 37	6 04	18 22	19 53	21 20	22 43
56	8 23	6 01	18 34	20 01	21 25	22 44
54	8 10	5 56	18 44	20 08	21 29	22 46
52	8 00	5 54	18 52	20 14	21 32	22 47
50	7 50	5 50	19 00	20 20	21 36	22 48
45	7 29	5 43	19 17	20 32	21 43	22 51
40	7 13	5 35	19 31	20 41	21 49	22 53
35	6 59	5 28	19 42	20 50	21 54	22 55
30	6 47	5 21	19 52	20 57	21 58	22 57
20	6 26	5 07	20 09	21 10	22 06	22 59
10	6 08	4 52	20 24	21 21	22 13	23 02
0	5 50	4 35	20 38	21 31	22 19	23 04
10	5 33	4 15	20 52	21 41	22 26	23 07
20	5 14	3 50	21 07	21 52	22 32	23 09
30	4 52	3 16	21 24	22 05	22 40	23 12
35	4 40	2 53	21 34	22 12	22 44	23 14
40	4 25	2 23	21 45	22 20	22 49	23 16
45	4 07	1 36	21 58	22 29	22 55	23 18
50	3 45	////	22 14	22 41	23 02	23 20
52	3 34	////	22 22	22 46	23 05	23 22
54	3 22	////	22 30	22 52	23 09	23 23
56	3 08	////	22 39	22 58	23 12	23 24
58	2 52	////	22 49	23 05	23 17	23 26
60	2 32	////	23 01	23 13	23 21	23 28
S						

Lat.	Sunset	Twlt. ends	Moonset 12	Moonset 13	Moonset 14	Moonset 15
N °	h m	h m	h m	h m	h m	h m
72	■	17 01	□	13 03	12 21	11 54
70	■	17 10	13 23	12 29	12 04	11 46
68	■	17 17	12 25	12 04	11 51	11 40
66	13 26	17 23	11 51	11 45	11 40	11 35
64	14 05	17 28	11 26	11 29	11 30	11 30
62	14 33	17 34	11 06	11 16	11 22	11 26
60	14 54	17 39	10 50	11 05	11 15	11 23
58	15 11	17 43	10 36	10 55	11 09	11 19
56	15 25	17 46	10 24	10 47	11 03	11 17
54	15 37	17 50	10 13	10 39	10 59	11 14
52	15 48	17 53	10 04	10 32	10 54	11 12
50	15 58	17 57	9 55	10 26	10 50	11 10
45	16 19	18 06	9 38	10 13	10 41	11 05
40	16 35	18 12	9 23	10 02	10 34	11 02
35	16 49	18 19	9 11	9 52	10 27	10 58
30	17 01	18 26	9 00	9 44	10 22	10 55
20	17 22	18 40	8 41	9 29	10 12	10 50
10	17 41	18 56	8 24	9 16	10 03	10 46
0	17 58	19 13	8 09	9 04	9 55	10 41
10	18 15	19 32	7 53	8 52	9 46	10 37
20	18 34	19 58	7 36	8 39	9 37	10 32
30	18 56	20 32	7 17	8 24	9 27	10 27
35	19 08	20 54	7 05	8 15	9 21	10 24
40	19 23	21 25	6 52	8 05	9 14	10 20
45	19 41	22 12	6 37	7 53	9 06	10 16
50	20 03	////	6 17	7 38	8 56	10 11
52	20 14	////	6 08	7 31	8 52	10 08
54	20 26	////	5 58	7 24	8 47	10 06
56	20 40	////	5 46	7 15	8 41	10 03
58	20 56	////	5 33	7 05	8 35	10 00
60	21 16	////	5 17	6 54	8 28	9 56
S						

Equation of Time (App.—Mean)

G M T	12	13	14
h	m s	m s	m s
0	+ 6 39.1	+ 6 11.2	+ 5 43.0
6	+ 6 32.1	+ 6 04.2	+ 5 35.9
12	+ 6 25.2	+ 5 57.2	+ 5 28.8
18	+ 6 18.2	+ 5 50.1	+ 5 21.7
24	+ 6 11.2	+ 5 43.0	+ 5 14.5

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
12	1 55	9 33	17 09	2 43	9 36
13	2 51	9 30	17 08	2 39	9 33
14	3 43	9 27	17 07	2 35	9 29
15	4 30	9 25	17 05	2 31	9 26

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.6	0.4	0.1
30			
	0.6	0.3	0.1
45			
	0.6	0.3	0.1
60			
	0.6	0.2	0.0
75			
	0.6	0.1	0.0
90			

Moon's Lower Limb Add

Alt.	12	13	14
°	′	′	′
0			
	18.7	17.5	16.3
4			
	18.7	17.5	16.3
8			
	18.7	17.4	16.3
12			
	18.7	17.4	16.3
16			
	18.6	17.4	16.3
20			
	18.6	17.4	16.3
24			
	18.5	17.3	16.3
28			
	18.4	17.3	16.2
32			
	18.3	17.2	16.2
36			
	18.2	17.1	16.2
40			
	18.1	17.1	16.2
44			
	18.0	17.0	16.1
48			
	17.8	16.9	16.1
52			
	17.7	16.8	16.1
56			
	17.6	16.8	16.0
60			
	17.4	16.7	16.0
64			
	17.2	16.6	16.0
68			
	17.1	16.5	15.9
72			
	16.9	16.4	15.9
76			
	16.8	16.3	15.8
80			
	16.6	16.2	15.8
84			
	16.4	16.1	15.8
88			
	16.3	16.0	15.7
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	12	13	14
°	′	′	′
0			
	13.7	14.5	15.1
4			
	13.7	14.5	15.1
8			
	13.8	14.5	15.1
12			
	13.8	14.5	15.1
16			
	13.9	14.5	15.1
20			
	13.9	14.6	15.2
24			
	14.0	14.6	15.2
28			
	14.1	14.7	15.2
32			
	14.2	14.7	15.2
36			
	14.3	14.8	15.2
40			
	14.4	14.8	15.3
44			
	14.5	14.9	15.3
48			
	14.6	15.0	15.3
52			
	14.8	15.1	15.4
56			
	14.9	15.2	15.4
60			
	15.1	15.3	15.4
64			
	15.2	15.3	15.5
68			
	15.4	15.4	15.5
72			
	15.5	15.5	15.5
76			
	15.7	15.6	15.6
80			
	15.9	15.8	15.6
84			
	16.1	15.9	15.7
88			
	16.2	15.9	15.7
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −4.4 GHA	VENUS Dec.	MARS 0.7 GHA	MARS Dec.	JUPITER −2.1 GHA	JUPITER Dec.	SATURN 0.8 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
15 0	83 07.0	218 32.9	−14 08.5	103 26.6	− 9 38.0	322 14.3	+20 45.2	218 15.7	−14 45.0	294 31.1	130	+ 8 17.1	−129
1	98 09.4	233 34.4	08.5	118 27.4	37.2	337 17.0	45.2	233 17.9	45.1	309 03.1	131	8 04.2	−130
2	113 11.9	248 35.9	08.4	133 28.2	36.5	352 19.7	45.3	248 20.1	45.1	323 35.2	131	7 51.2	−129
3	128 14.3	263 37.5	•• 08.3	148 29.0	•• 35.8	7 22.4	•• 45.3	263 22.3	•• 45.2	338 07.3	133	• 7 38.3	−130
4	143 16.8	278 39.0	08.3	163 29.8	35.1	22 25.1	45.4	278 24.5	45.3	352 39.6	133	7 25.3	−129
5	158 19.3	293 40.5	08.2	178 30.6	34.3	37 27.8	45.4	293 26.7	45.4	7 11.9	133	7 12.4	−130
6	173 21.7	308 42.0	−14 08.2	193 31.4	− 9 33.6	52 30.5	+20 45.5	308 28.9	−14 45.4	21 44.2	135	+ 6 59.4	−130
7	188 24.2	323 43.6	08.1	208 32.2	32.9	67 33.2	45.5	323 31.1	45.5	36 16.7	135	6 46.4	−131
8	203 26.7	338 45.1	08.1	223 33.0	32.2	82 35.9	45.6	338 33.3	45.6	50 49.2	135	6 33.3	−130
9	218 29.1	353 46.6	•• 08.0	238 33.8	•• 31.5	97 38.5	•• 45.7	353 35.5	•• 45.6	65 21.7	137	• 6 20.3	−130
10	233 31.6	8 48.1	08.0	253 34.6	30.7	112 41.2	45.7	8 37.7	45.7	79 54.4	137	6 07.3	−131
11	248 34.1	23 49.6	07.9	268 35.4	30.0	127 43.9	45.8	23 39.9	45.8	94 27.1	137	5 54.2	−130
12	263 36.5	38 51.1	−14 07.9	283 36.2	− 9 29.3	142 46.6	+20 45.8	38 42.1	−14 45.8	108 59.8	139	+ 5 41.2	−131
13	278 39.0	53 52.6	07.8	298 37.0	28.6	157 49.3	45.9	53 44.3	45.9	123 32.7	138	5 28.1	−131
14	293 41.5	68 54.1	07.8	313 37.8	27.8	172 52.0	45.9	68 46.6	46.0	138 05.5	140	5 15.0	−131
15	308 43.9	83 55.6	•• 07.8	328 38.6	•• 27.1	187 54.7	•• 46.0	83 48.8	•• 46.1	152 38.5	140	• 5 01.9	−131
16	323 46.4	98 57.1	07.7	343 39.5	26.4	202 57.4	46.0	98 51.0	46.1	167 11.5	141	4 48.8	−130
17	338 48.8	113 58.6	07.7	358 40.3	25.7	218 00.1	46.1	113 53.2	46.2	181 44.6	141	4 35.8	−131
18	353 51.3	129 00.1	−14 07.7	13 41.1	− 9 24.9	233 02.8	+20 46.1	128 55.4	−14 46.3	196 17.7	142	+ 4 22.7	−131
19	8 53.8	144 01.6	07.6	28 41.9	24.2	248 05.5	46.2	143 57.6	46.3	210 50.9	142	4 09.6	−131
20	23 56.2	159 03.1	07.6	43 42.7	23.5	263 08.2	46.2	158 59.8	46.4	225 24.1	143	3 56.5	−131
21	38 58.7	174 04.5	•• 07.6	58 43.5	•• 22.8	278 10.9	•• 46.3	174 02.0	•• 46.5	239 57.4	143	• 3 43.4	−131
22	54 01.2	189 06.0	07.5	73 44.3	22.1	293 13.6	46.3	189 04.2	46.5	254 30.7	144	3 30.3	−131
23	69 03.6	204 07.5	07.5	88 45.1	21.3	308 16.3	46.4	204 06.4	46.6	269 04.1	144	3 17.2	−131
16 0	84 06.1	219 09.0	−14 07.5	103 45.9	− 9 20.6	323 19.0	+20 46.4	219 08.6	−14 46.7	283 37.5	145	+ 3 04.1	−131
1	99 08.6	234 10.4	07.5	118 46.7	19.9	338 21.7	46.5	234 10.8	46.7	298 11.0	145	2 51.0	−131
2	114 11.0	249 11.9	07.4	133 47.5	19.2	353 24.4	46.5	249 13.0	46.8	312 44.5	146	2 37.9	−130
3	129 13.5	264 13.3	•• 07.4	148 48.3	•• 18.4	8 27.1	•• 46.6	264 15.2	•• 46.9	327 18.1	146	• 2 24.9	−131
4	144 16.0	279 14.8	07.4	163 49.1	17.7	23 29.8	46.7	279 17.4	47.0	341 51.7	147	2 11.8	−131
5	159 18.4	294 16.3	07.4	178 49.9	17.0	38 32.5	46.7	294 19.6	47.0	356 25.4	147	1 58.7	−130
6	174 20.9	309 17.7	−14 07.4	193 50.7	− 9 16.3	53 35.2	+20 46.8	309 21.8	−14 47.1	10 59.1	147	+ 1 45.7	−131
7	189 23.3	324 19.2	07.3	208 51.5	15.5	68 37.9	46.8	324 24.0	47.2	25 32.8	148	1 32.6	−130
8	204 25.8	339 20.6	07.3	223 52.3	14.8	83 40.6	46.9	339 26.2	47.2	40 06.6	149	1 19.6	−131
9	219 28.3	354 22.0	•• 07.3	238 53.2	•• 14.1	98 43.3	•• 46.9	354 28.4	•• 47.3	54 40.5	148	• 1 06.5	−130
10	234 30.7	9 23.5	07.3	253 54.0	13.4	113 46.0	47.0	9 30.6	47.4	69 14.3	149	0 53.5	−130
11	249 33.2	24 24.9	07.3	268 54.8	12.6	128 48.7	47.0	24 32.9	47.4	83 48.2	150	0 40.5	−130
12	264 35.7	39 26.4	−14 07.3	283 55.6	− 9 11.9	143 51.4	+20 47.1	39 35.1	−14 47.5	98 22.2	149	+ 0 27.5	−130
13	279 38.1	54 27.8	07.3	298 56.4	11.2	158 54.1	47.1	54 37.3	47.6	112 56.1	150	0 14.5	−129
14	294 40.6	69 29.2	07.3	313 57.2	10.5	173 56.8	47.2	69 39.5	47.6	127 30.1	151	+ 0 01.6	−130
15	309 43.1	84 30.6	•• 07.3	328 58.0	•• 09.7	188 59.5	•• 47.2	84 41.7	•• 47.7	142 04.2	150	− 0 11.4	−129
16	324 45.5	99 32.1	07.3	343 58.8	09.0	204 02.2	47.3	99 43.9	47.8	156 38.2	151	0 24.3	−130
17	339 48.0	114 33.5	07.3	358 59.6	08.3	219 04.9	47.4	114 46.1	47.9	171 12.3	152	0 37.3	−129
18	354 50.4	129 34.9	−14 07.3	14 00.4	− 9 07.5	234 07.6	+20 47.4	129 48.3	−14 47.9	185 46.5	151	− 0 50.2	−129
19	9 52.9	144 36.3	07.3	29 01.2	06.8	249 10.3	47.5	144 50.5	48.0	200 20.6	152	1 03.1	−128
20	24 55.4	159 37.7	07.3	44 02.0	06.1	264 13.0	47.5	159 52.7	48.1	214 54.8	152	1 15.9	−129
21	39 57.8	174 39.1	•• 07.3	59 02.8	•• 05.4	279 15.7	•• 47.6	174 54.9	•• 48.1	229 29.0	152	• 1 28.8	−128
22	55 00.3	189 40.5	07.3	74 03.6	04.6	294 18.4	47.6	189 57.1	48.2	244 03.2	153	1 41.6	−128
23	70 02.8	204 41.9	07.3	89 04.4	03.9	309 21.2	47.7	204 59.3	48.3	258 37.5	153	1 54.4	−128
17 0	85 05.2	219 43.3	−14 07.3	104 05.3	− 9 03.2	324 23.9	+20 47.7	220 01.5	−14 48.3	273 11.8	153	− 2 07.2	−128
1	100 07.7	234 44.7	07.3	119 06.1	02.5	339 26.6	47.8	235 03.7	48.4	287 46.1	153	2 20.0	−127
2	115 10.2	249 46.1	07.4	134 06.9	01.7	354 29.3	47.8	250 05.9	48.5	302 20.4	153	2 32.7	−128
3	130 12.6	264 47.5	•• 07.4	149 07.7	•• 01.0	9 32.0	•• 47.9	265 08.1	•• 48.5	316 54.7	154	• 2 45.5	−127
4	145 15.1	279 48.9	07.4	164 08.5	9 00.3	24 34.7	47.9	280 10.4	48.6	331 29.1	154	2 58.2	−126
5	160 17.6	294 50.2	07.4	179 09.3	8 59.5	39 37.4	48.0	295 12.6	48.7	346 03.5	154	3 10.8	−127
6	175 20.0	309 51.6	−14 07.4	194 10.1	− 8 58.8	54 40.1	+20 48.1	310 14.8	−14 48.7	0 37.9	154	− 3 23.5	−126
7	190 22.5	324 53.0	07.4	209 10.9	58.1	69 42.8	48.1	325 17.0	48.8	15 12.3	154	3 36.1	−126
8	205 24.9	339 54.4	07.5	224 11.7	57.4	84 45.5	48.2	340 19.2	48.9	29 46.7	154	3 48.7	−126
9	220 27.4	354 55.7	•• 07.5	239 12.5	•• 56.6	99 48.2	•• 48.2	355 21.4	•• 48.9	44 21.1	154	• 4 01.3	−125
10	235 29.9	9 57.1	07.5	254 13.3	55.9	114 50.9	48.3	10 23.6	49.0	58 55.5	155	4 13.8	−125
11	250 32.3	24 58.5	07.5	269 14.1	55.2	129 53.6	48.3	25 25.8	49.1	73 30.0	155	4 26.3	−125
12	265 34.8	39 59.8	−14 07.6	284 14.9	− 8 54.5	144 56.4	+20 48.4	40 28.0	−14 49.2	88 04.5	154	− 4 38.8	−125
13	280 37.3	55 01.2	07.6	299 15.8	53.7	159 59.1	48.4	55 30.2	49.2	102 38.9	155	4 51.3	−124
14	295 39.7	70 02.6	07.6	314 16.6	53.0	175 01.8	48.5	70 32.4	49.3	117 13.4	155	5 03.7	−124
15	310 42.2	85 03.9	•• 07.7	329 17.4	•• 52.3	190 04.5	•• 48.5	85 34.6	•• 49.4	131 47.9	155	• 5 16.1	−124
16	325 44.7	100 05.3	07.7	344 18.2	51.5	205 07.2	48.6	100 36.8	49.4	146 22.4	155	5 28.5	−123
17	340 47.1	115 06.6	07.7	359 19.0	50.8	220 09.9	48.7	115 39.0	49.5	160 56.9	155	5 40.8	−123
18	355 49.6	130 08.0	−14 07.8	14 19.8	− 8 50.1	235 12.6	+20 48.7	130 41.3	−14 49.6	175 31.4	155	− 5 53.1	−123
19	10 52.0	145 09.3	07.8	29 20.6	49.4	250 15.3	48.8	145 43.5	49.6	190 05.9	155	6 05.4	−122
20	25 54.5	160 10.6	07.8	44 21.4	48.6	265 18.0	48.8	160 45.7	49.7	204 40.4	155	6 17.6	−122
21	40 57.0	175 12.0	•• 07.9	59 22.2	•• 47.9	280 20.7	•• 48.9	175 47.9	•• 49.8	219 14.9	155	• 6 29.8	−122
22	55 59.4	190 13.3	07.9	74 23.0	47.2	295 23.5	48.9	190 50.1	49.8	233 49.4	155	6 42.0	−121
23	71 01.9	205 14.6	08.0	89 23.8	46.4	310 26.2	49.0	205 52.3	49.9	248 23.9	155	6 54.1	−121
24	86 04.4	220 16.0	−14 08.0	104 24.7	− 8 45.7	325 28.9	+20 49.0	220 54.5	−14 50.0	262 58.4	155	− 7 06.2	−121
code	−	+ 14	0	+ 8	+ 7	+ 27	0	+ 22	− 1				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
15 0	181 18.5	−23 13.9
1	196 18.2	14.0
2	211 17.9	14.2
3	226 17.6 ··	14.3
4	241 17.3	14.5
5	256 17.0	14.6
6	271 16.7	−23 14.7
7	286 16.4	14.9
8	301 16.1	15.0
9	316 15.8 ··	15.2
10	331 15.5	15.3
11	346 15.2	15.4
12	1 14.9	−23 15.6
13	16 14.6	15.7
14	31 14.3	15.8
15	46 14.0 ··	16.0
16	61 13.7	16.1
17	76 13.4	16.2
18	91 13.1	−23 16.4
19	106 12.8	16.5
20	121 12.5	16.6
21	136 12.2 ··	16.7
22	151 11.9	16.9
23	166 11.6	17.0
16 0	181 11.3	−23 17.1
1	196 11.0	17.2
2	211 10.7	17.4
3	226 10.4 ··	17.5
4	241 10.1	17.6
5	256 09.8	17.7
6	271 09.5	−23 17.9
7	286 09.2	18.0
8	301 08.9	18.1
9	316 08.6 ··	18.2
10	331 08.3	18.3
11	346 07.9	18.4
12	1 07.6	−23 18.6
13	16 07.3	18.7
14	31 07.0	18.8
15	46 06.7 ··	18.9
16	61 06.4	19.0
17	76 06.1	19.1
18	91 05.8	−23 19.2
19	106 05.5	19.3
20	121 05.2	19.5
21	136 04.9 ··	19.6
22	151 04.6	19.7
23	166 04.3	19.8
17 0	181 04.0	−23 19.9
1	196 03.7	20.0
2	211 03.4	20.1
3	226 03.1 ··	20.2
4	241 02.8	20.3
5	256 02.5	20.4
6	271 02.2	−23 20.5
7	286 01.9	20.6
8	301 01.6	20.7
9	316 01.3 ··	20.8
10	331 01.0	20.9
11	346 00.6	21.0
12	1 00.3	−23 21.1
13	16 00.0	21.2
14	30 59.7	21.3
15	45 59.4 ··	21.4
16	60 59.1	21.5
17	75 58.8	21.6
18	90 58.5	−23 21.7
19	105 58.2	21.7
20	120 57.9	21.8
21	135 57.6 ··	21.9
22	150 57.3	22.0
23	165 57.0	22.1
24	180 56.7	−23 22.2
code	—	− 1

No.	STARS Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.2	−40 29.1
5	Achernar	335 58.9	−57 28.0
30	Acrux	173 58.7	−62 50.8
19	Adhara	255 46.6	−28 54.5
10	Aldebaran	291 39.4	+16 25.3
32	Alioth	166 59.2	+56 11.9
34	Alkaid	153 33.6	+49 31.9
55	Al Na'ir	28 38.8	−47 10.9
15	Alnilam	276 30.5	− 1 13.7
25	Alphard	218 39.0	− 8 27.8
41	Alphecca	126 48.4	+26 51.8
1	Alpheratz	358 28.9	+28 50.8
51	Altair	62 51.3	+ 8 45.0
2	Ankaa	353 58.7	−42 33.1
42	Antares	113 20.4	−26 20.0
37	Arcturus	146 35.9	+19 24.8
43	Atria	109 02.3	−68 56.8
22	Avior	234 35.5	−59 21.7
13	Bellatrix	279 18.7	+ 6 18.7
16	Betelg'se	271 48.4	+ 7 24.0
17	Canopus	264 15.1	−52 40.2
12	Capella	281 38.8	+45 57.3
53	Deneb	50 01.8	+45 07.4
28	Denebola	183 18.3	+14 49.3
4	Diphda	349 39.7	−18 14.0
27	Dubhe	194 45.1	+61 59.3
14	Elnath	279 07.7	+28 34.3
47	Eltanin	91 07.1	+51 29.6
54	Enif	34 30.3	+ 9 40.2
56	Fomalhaut	16 12.3	−29 51.7
31	Gacrux	172 50.1	−56 51.5
29	Gienah	176 37.5	−17 17.5
35	Hadar	149 50.7	−60 09.3
6	Hamal	328 50.1	+23 15.2
48	Kaus Aust.	84 42.3	−34 24.5
40	Kochab	137 18.7	+74 20.1
57	Markab	14 22.1	+14 58.0
8	Menkar	315 00.6	+ 3 55.0
36	Menkent	148 59.6	−36 08.9
24	Miapl'dus	221 48.7	−69 31.7
9	Mirfak	309 42.8	+49 42.4
50	Nunki	76 53.0	−26 21.3
52	Peacock	54 28.6	−56 53.0
21	Pollux	244 20.9	+28 08.1
20	Procyon	245 45.3	+ 5 20.5
46	R'alhague	96 47.5	+12 35.5
26	Regulus	208 30.0	+12 11.1
11	Rigel	281 53.8	− 8 15.1
38	Rigil Kent.	140 52.3	−60 39.0
44	Sabik	103 03.2	−15 40.3
3	Schedar	350 30.5	+56 17.8
45	Shaula	97 21.9	−37 04.4
18	Sirius	259 12.0	−16 39.1
33	Spica	159 17.7	−10 55.6
23	Suhail	223 24.5	−43 14.9
49	Vega	81 09.1	+38 44.5
39	Zub'g'bi	137 54.3	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 15	Moonrise 16	Moonrise 17	Moonrise 18
N °	h m	h m	h m	h m	h m	h m
72	■	6 49	22 22	24 16	0 16	2 09
70	■	6 41	22 26	24 13	0 13	1 57
68	■	6 33	22 30	24 10	0 10	1 48
66	10 28	6 26	22 34	24 08	0 08	1 40
64	9 47	6 21	22 36	24 06	0 06	1 34
62	9 19	6 16	22 39	24 04	0 04	1 28
60	8 58	6 12	22 41	24 03	0 03	1 23
58	8 40	6 08	22 43	24 02	0 02	1 19
56	8 26	6 03	22 44	24 01	0 01	1 15
54	8 13	5 59	22 46	24 00	0 00	1 12
52	8 02	5 55	22 47	23 59	25 09	1 09
50	7 52	5 53	22 48	23 58	25 06	1 06
45	7 32	5 44	22 51	23 56	25 00	1 00
40	7 15	5 37	22 53	23 55	24 55	0 55
35	7 01	5 29	22 55	23 53	24 51	0 51
30	6 49	5 23	22 57	23 52	24 47	0 47
20	6 28	5 08	22 59	23 50	24 40	0 40
10	6 09	4 54	23 02	23 49	24 35	0 35
0	5 52	4 36	23 04	23 47	24 29	0 29
10	5 34	4 16	23 07	23 46	24 24	0 24
20	5 15	3 51	23 09	23 44	24 19	0 19
30	4 53	3 17	23 12	23 43	24 12	0 12
35	4 40	2 53	23 14	23 42	24 09	0 09
40	4 25	2 22	23 16	23 40	24 05	0 05
45	4 08	1 35	23 18	23 39	24 00	0 00
50	3 45	////	23 20	23 38	23 54	24 13
52	3 34	////	23 22	23 37	23 52	24 08
54	3 22	////	23 23	23 36	23 49	24 04
56	3 08	////	23 24	23 35	23 46	23 58
58	2 51	////	23 26	23 34	23 43	23 52
60 S	2 31	////	23 28	23 33	23 39	23 46

Lat.	Sunset	Twlt. ends	Moonset 15	Moonset 16	Moonset 17	Moonset 18
N °	h m	h m	h m	h m	h m	h m
72	■	17 00	11 54	11 31	11 09	10 45
70	■	17 09	11 46	11 31	11 15	10 59
68	■	17 16	11 40	11 30	11 20	11 10
66	13 22	17 23	11 35	11 30	11 25	11 20
64	14 04	17 29	11 30	11 29	11 28	11 28
62	14 32	17 34	11 26	11 29	11 32	11 35
60	14 53	17 39	11 23	11 29	11 34	11 41
58	15 10	17 43	11 19	11 28	11 37	11 46
56	15 25	17 47	11 17	11 28	11 39	11 50
54	15 38	17 51	11 14	11 28	11 41	11 55
52	15 49	17 55	11 12	11 28	11 43	11 59
50	15 58	17 57	11 10	11 28	11 45	12 02
45	16 19	18 06	11 05	11 27	11 48	12 10
40	16 36	18 14	11 02	11 27	11 51	12 16
35	16 50	18 21	10 58	11 27	11 54	12 22
30	17 02	18 27	10 55	11 26	11 56	12 27
20	17 23	18 42	10 50	11 26	12 00	12 35
10	17 42	18 57	10 46	11 25	12 04	12 43
0	17 59	19 14	10 41	11 25	12 07	12 50
10	18 16	19 34	10 37	11 25	12 11	12 57
20	18 35	19 59	10 32	11 24	12 15	13 04
30	18 57	20 33	10 27	11 24	12 19	13 13
35	19 10	20 57	10 24	11 23	12 21	13 18
40	19 25	21 28	10 20	11 23	12 24	13 24
45	19 43	22 16	10 16	11 22	12 27	13 30
50	20 06	////	10 11	11 22	12 31	13 38
52	20 16	////	10 08	11 22	12 32	13 42
54	20 29	////	10 06	11 21	12 34	13 46
56	20 43	////	10 03	11 21	12 36	13 51
58	20 59	////	10 00	11 21	12 39	13 56
60 S	21 20	////	9 56	11 20	12 41	14 01

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.6	0.4	0.1
30	0.6	0.3	0.1
45	0.6	0.2	0.1
60	0.6	0.2	0.0
75	0.6	0.1	0.0
90			

Moon's Lower Limb Add

Alt.	15	16	17
°	′	′	′
0	15.2	14.0	13.3
4	15.2	14.0	13.3
8	15.2	14.0	13.3
12	15.2	14.1	13.3
16	15.2	14.1	13.3
20	15.2	14.1	13.4
24	15.2	14.1	13.4
28	15.2	14.2	13.5
32	15.2	14.2	13.6
36	15.2	14.3	13.6
40	15.2	14.3	13.7
44	15.3	14.4	13.8
48	15.3	14.5	13.9
52	15.3	14.5	14.0
56	15.3	14.6	14.1
60	15.3	14.7	14.2
64	15.3	14.7	14.3
68	15.4	14.8	14.4
72	15.4	14.9	14.6
76	15.4	15.0	14.7
80	15.4	15.1	14.8
84	15.4	15.1	14.9
88	15.5	15.2	15.0
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	15	16	17
°	′	′	′
0	15.8	16.4	16.9
4	15.8	16.4	16.8
8	15.8	16.4	16.8
12	15.8	16.4	16.8
16	15.8	16.4	16.8
20	15.7	16.3	16.7
24	15.7	16.3	16.7
28	15.7	16.3	16.6
32	15.7	16.2	16.6
36	15.7	16.2	16.5
40	15.7	16.1	16.4
44	15.7	16.1	16.3
48	15.7	16.0	16.2
52	15.6	15.9	16.1
56	15.6	15.9	16.0
60	15.6	15.8	15.9
64	15.6	15.7	15.8
68	15.6	15.6	15.7
72	15.6	15.6	15.6
76	15.5	15.5	15.4
80	15.5	15.4	15.3
84	15.5	15.3	15.2
88	15.5	15.2	15.1
90			

Subtract from table, back cover

Equation of Time (App.—Mean)

GMT	15	16	17
h	m s	m s	m s
0	+ 5 14.5	+ 4 45.7	+ 4 16.6
6	+ 5 07.3	+ 4 38.5	+ 4 09.3
12	+ 5 00.1	+ 4 31.2	+ 4 02.0
18	+ 4 52.9	+ 4 23.9	+ 3 54.6
24	+ 4 45.7	+ 4 16.6	+ 3 47.3

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
15	4 30	9 25	17 05	2 31	9 26
16	5 15	9 23	17 04	2 26	9 22
17	5 57	9 20	17 03	2 22	9 19
18	6 39	9 18	17 01	2 18	9 15

Last Quarter 17

992941°—53——14

GMT		♈ GHA	VENUS −4.4 GHA	VENUS Dec.	MARS 0.7 GHA	MARS Dec.	JUPITER −2.1 GHA	JUPITER Dec.	SATURN 0.8 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
18	0	86 04.4	220 16.0	−14 08.0	104 24.7	− 8 45.7	325 28.9	+20 49.0	220 54.5	−14 50.0	262 58.4	155	− 7 06.2	−121
	1	101 06.8	235 17.3	08.1	119 25.5	45.0	340 31.6	49.1	235 56.7	50.0	277 32.9	155	7 18.3	−120
	2	116 09.3	250 18.6	08.1	134 26.3	44.2	355 34.3	49.2	250 58.9	50.1	292 07.4	154	7 30.3	−119
	3	131 11.8	265 19.9	·· 08.2	149 27.1	·· 43.5	10 37.0	·· 49.2	266 01.1	·· 50.2	306 41.8	155	· 7 42.2	−120
	4	146 14.2	280 21.2	08.2	164 27.9	42.8	25 39.7	49.3	281 03.3	50.2	321 16.3	155	7 54.2	−119
	5	161 16.7	295 22.6	08.3	179 28.7	42.1	40 42.5	49.3	296 05.5	50.3	335 50.8	155	8 06.1	−118
	6	176 19.2	310 23.9	−14 08.3	194 29.5	− 8 41.3	55 45.2	+20 49.4	311 07.8	−14 50.4	350 25.3	154	− 8 17.9	−119
	7	191 21.6	325 25.2	08.4	209 30.3	40.6	70 47.9	49.4	326 10.0	50.4	4 59.7	155	8 29.8	−117
	8	206 24.1	340 26.5	08.4	224 31.1	39.9	85 50.6	49.5	341 12.2	50.5	19 34.2	154	8 41.5	−118
	9	221 26.5	355 27.8	·· 08.5	239 31.9	·· 39.1	100 53.3	·· 49.5	356 14.4	·· 50.6	34 08.6	154	· 8 53.3	−117
	10	236 29.0	10 29.1	08.5	254 32.7	38.4	115 56.0	49.6	11 16.6	50.6	48 43.0	154	9 05.0	−116
	11	251 31.5	25 30.4	08.6	269 33.6	37.7	130 58.7	49.7	26 18.8	50.7	63 17.4	154	9 16.6	−116
	12	266 33.9	40 31.7	−14 08.7	284 34.4	− 8 36.9	146 01.5	+20 49.7	41 21.0	−14 50.8	77 51.8	154	− 9 28.2	−116
	13	281 36.4	55 33.0	08.7	299 35.2	36.2	161 04.2	49.8	56 23.2	50.8	92 26.2	154	9 39.8	−115
	14	296 38.9	70 34.2	08.8	314 36.0	35.5	176 06.9	49.8	71 25.4	50.9	107 00.6	153	9 51.3	−115
	15	311 41.3	85 35.5	·· 08.9	329 36.8	·· 34.8	191 09.6	·· 49.9	86 27.6	·· 51.0	121 34.9	154	·10 02.8	−114
	16	326 43.8	100 36.8	08.9	344 37.6	34.0	206 12.3	49.9	101 29.8	51.1	136 09.3	153	10 14.2	−114
	17	341 46.3	115 38.1	09.0	359 38.4	33.3	221 15.0	50.0	116 32.1	51.1	150 43.6	153	10 25.6	−113
	18	356 48.7	130 39.4	−14 09.1	14 39.2	− 8 32.6	236 17.8	+20 50.0	131 34.3	−14 51.2	165 17.9	153	−10 36.9	−113
	19	11 51.2	145 40.6	09.1	29 40.0	31.8	251 20.5	50.1	146 36.5	51.3	179 52.2	152	10 48.2	−112
	20	26 53.7	160 41.9	09.2	44 40.8	31.1	266 23.2	50.2	161 38.7	51.3	194 26.4	153	10 59.4	−112
	21	41 56.1	175 43.2	·· 09.3	59 41.7	·· 30.4	281 25.9	·· 50.2	176 40.9	·· 51.4	209 00.7	152	·11 10.6	−111
	22	56 58.6	190 44.5	09.4	74 42.5	29.6	296 28.6	50.3	191 43.1	51.5	223 34.9	152	11 21.7	−111
	23	72 01.0	205 45.7	09.4	89 43.3	28.9	311 31.4	50.3	206 45.3	51.5	238 09.1	152	11 32.8	−110
19	0	87 03.5	220 47.0	−14 09.5	104 44.1	− 8 28.2	326 34.1	+20 50.4	221 47.5	−14 51.6	252 43.3	151	−11 43.8	−110
	1	102 06.0	235 48.2	09.6	119 44.9	27.4	341 36.8	50.4	236 49.7	51.7	267 17.4	151	11 54.8	−110
	2	117 08.4	250 49.5	09.7	134 45.7	26.7	356 39.5	50.5	251 51.9	51.7	281 51.5	151	12 05.8	−108
	3	132 10.9	265 50.7	·· 09.8	149 46.5	·· 26.0	11 42.2	·· 50.6	266 54.2	·· 51.8	296 25.6	151	·12 16.6	−109
	4	147 13.4	280 52.0	09.8	164 47.3	25.2	26 44.9	50.6	281 56.4	51.9	310 59.7	150	12 27.5	−107
	5	162 15.8	295 53.2	09.9	179 48.1	24.5	41 47.7	50.7	296 58.6	51.9	325 33.7	151	12 38.2	−107
	6	177 18.3	310 54.5	−14 10.0	194 49.0	− 8 23.8	56 50.4	+20 50.7	312 00.8	−14 52.0	340 07.8	150	−12 48.9	−107
	7	192 20.8	325 55.7	10.1	209 49.8	23.0	71 53.1	50.8	327 03.0	52.1	354 41.8	149	12 59.6	−106
	8	207 23.2	340 57.0	10.2	224 50.6	22.3	86 55.8	50.8	342 05.2	52.1	9 15.7	149	13 10.2	−105
	9	222 25.7	355 58.2	·· 10.3	239 51.4	·· 21.6	101 58.6	·· 50.9	357 07.4	·· 52.2	23 49.6	149	·13 20.7	−105
	10	237 28.1	10 59.4	10.4	254 52.2	20.8	117 01.3	51.0	12 09.6	52.3	38 23.5	149	13 31.2	−105
	11	252 30.6	26 00.7	10.4	269 53.0	20.1	132 04.0	51.0	27 11.8	52.3	52 57.4	148	13 41.7	−103
	12	267 33.1	41 01.9	−14 10.5	284 53.8	− 8 19.4	147 06.7	+20 51.1	42 14.1	−14 52.4	67 31.2	148	−13 52.0	−103
	13	282 35.5	56 03.1	10.6	299 54.6	18.6	162 09.4	51.1	57 16.3	52.5	82 05.0	148	14 02.3	−103
	14	297 38.0	71 04.3	10.7	314 55.4	17.9	177 12.2	51.2	72 18.5	52.5	96 38.8	147	14 12.6	−102
	15	312 40.5	86 05.6	·· 10.8	329 56.3	·· 17.2	192 14.9	·· 51.2	87 20.7	·· 52.6	111 12.5	147	·14 22.8	−101
	16	327 42.9	101 06.8	10.9	344 57.1	16.4	207 17.6	51.3	102 22.9	52.7	125 46.2	147	14 32.9	−101
	17	342 45.4	116 08.0	11.0	359 57.9	15.7	222 20.3	51.3	117 25.1	52.7	140 19.9	146	14 43.0	−100
	18	357 47.9	131 09.2	−14 11.1	14 58.7	− 8 15.0	237 23.1	+20 51.4	132 27.3	−14 52.8	154 53.5	146	−14 53.0	− 99
	19	12 50.3	146 10.4	11.2	29 59.5	14.2	252 25.8	51.5	147 29.5	52.9	169 27.1	146	15 02.9	− 99
	20	27 52.8	161 11.6	11.3	45 00.3	13.5	267 28.5	51.5	162 31.7	52.9	184 00.7	145	15 12.8	− 98
	21	42 55.3	176 12.8	·· 11.4	60 01.1	·· 12.8	282 31.2	·· 51.6	177 34.0	·· 53.0	198 34.2	145	·15 22.6	− 98
	22	57 57.7	191 14.0	11.5	75 01.9	12.0	297 34.0	51.6	192 36.2	53.1	213 07.7	144	15 32.4	− 97
	23	73 00.2	206 15.2	11.7	90 02.7	11.3	312 36.7	51.7	207 38.4	53.1	227 41.1	144	15 42.1	− 96
20	0	88 02.6	221 16.4	−14 11.8	105 03.6	− 8 10.6	327 39.4	+20 51.8	222 40.6	−14 53.2	242 14.5	144	−15 51.7	− 95
	1	103 05.1	236 17.6	11.9	120 04.4	09.8	342 42.1	51.8	237 42.8	53.3	256 47.9	143	16 01.2	− 95
	2	118 07.6	251 18.8	12.0	135 05.2	09.1	357 44.9	51.9	252 45.0	53.3	271 21.2	143	16 10.7	− 95
	3	133 10.0	266 20.0	·· 12.1	150 06.0	·· 08.4	12 47.6	·· 51.9	267 47.2	·· 53.4	285 54.5	142	·16 20.2	− 93
	4	148 12.5	281 21.2	12.2	165 06.8	07.6	27 50.3	52.0	282 49.4	53.4	300 27.7	142	16 29.5	− 93
	5	163 15.0	296 22.3	12.3	180 07.6	06.9	42 53.0	52.0	297 51.7	53.5	315 00.9	142	16 38.8	− 92
	6	178 17.4	311 23.5	−14 12.4	195 08.4	− 8 06.2	57 55.8	+20 52.1	312 53.9	−14 53.6	329 34.1	141	−16 48.0	− 91
	7	193 19.9	326 24.7	12.6	210 09.2	05.4	72 58.5	52.2	327 56.1	53.6	344 07.2	141	16 57.1	− 91
	8	208 22.4	341 25.9	12.7	225 10.1	04.7	88 01.2	52.2	342 58.3	53.7	358 40.3	140	17 06.2	− 90
	9	223 24.8	356 27.0	·· 12.8	240 10.9	·· 04.0	103 04.0	·· 52.3	358 00.5	·· 53.8	13 13.3	140	·17 15.2	− 89
	10	238 27.3	11 28.2	12.9	255 11.7	03.2	118 06.7	52.3	13 02.7	53.8	27 46.3	139	17 24.1	− 89
	11	253 29.8	26 29.4	13.0	270 12.5	02.5	133 09.4	52.4	28 04.9	53.9	42 19.2	139	17 33.0	− 87
	12	268 32.2	41 30.6	−14 13.2	285 13.3	− 8 01.8	148 12.1	+20 52.4	43 07.2	−14 54.0	56 52.1	139	−17 41.7	− 87
	13	283 34.7	56 31.7	13.3	300 14.1	01.0	163 14.9	52.5	58 09.4	54.0	71 25.0	138	17 50.4	− 87
	14	298 37.1	71 32.9	13.4	315 14.9	8 00.3	178 17.6	52.6	73 11.6	54.1	85 57.8	137	17 59.1	− 85
	15	313 39.6	86 34.0	·· 13.5	330 15.7	· 7 59.5	193 20.3	·· 52.6	88 13.8	·· 54.2	100 30.5	137	·18 07.6	− 85
	16	328 42.1	101 35.2	13.7	345 16.6	58.8	208 23.1	52.7	103 16.0	54.2	115 03.2	137	18 16.1	− 84
	17	343 44.5	116 36.3	13.8	0 17.4	58.1	223 25.8	52.7	118 18.2	54.3	129 35.9	136	18 24.5	− 83
	18	358 47.0	131 37.5	−14 13.9	15 18.2	− 7 57.3	238 28.5	+20 52.8	133 20.4	−14 54.4	144 08.5	136	−18 32.8	− 82
	19	13 49.5	146 38.6	14.1	30 19.0	56.6	253 31.3	52.9	148 22.6	54.4	158 41.1	135	18 41.0	− 82
	20	28 51.9	161 39.8	14.2	45 19.8	55.9	268 34.0	52.9	163 24.9	54.5	173 13.6	135	18 49.2	− 81
	21	43 54.4	176 40.9	·· 14.3	60 20.6	·· 55.1	283 36.7	·· 53.0	178 27.1	·· 54.6	187 46.1	134	·18 57.3	− 80
	22	58 56.9	191 42.0	14.5	75 21.4	54.4	298 39.5	53.0	193 29.3	54.6	202 18.5	134	19 05.3	− 79
	23	73 59.3	206 43.2	14.6	90 22.3	53.7	313 42.2	53.1	208 31.5	54.7	216 50.9	133	19 13.2	− 78
	24	89 01.8	221 44.3	−14 14.7	105 23.1	− 7 52.9	328 44.9	+20 53.1	223 33.7	−14 54.8	231 23.2	133	−19 21.0	− 78
code		—	+ 12	− 1	+ 8	+ 8	+ 27	0	+ 22	− 1				

GMT		SUN GHA	SUN Dec.
d	h	° ′	° ′
18	0	180 56.7	−23 22.2
	1	195 56.4	22.3
	2	210 56.1	22.4
	3	225 55.7	•• 22.4
	4	240 55.4	22.5
	5	255 55.1	22.6
	6	270 54.8	−23 22.7
	7	285 54.5	22.8
	8	300 54.2	22.8
	9	315 53.9	•• 22.9
	10	330 53.6	23.0
	11	345 53.3	23.1
	12	0 53.0	−23 23.2
	13	15 52.7	23.2
	14	30 52.4	23.3
	15	45 52.1	•• 23.4
	16	60 51.7	23.5
	17	75 51.4	23.5
	18	90 51.1	−23 23.6
	19	105 50.8	23.7
	20	120 50.5	23.7
	21	135 50.2	•• 23.8
	22	150 49.9	23.9
	23	165 49.6	23.9
19	0	180 49.3	−23 24.0
	1	195 49.0	24.1
	2	210 48.7	24.1
	3	225 48.4	•• 24.2
	4	240 48.0	24.3
	5	255 47.7	24.3
	6	270 47.4	−23 24.4
	7	285 47.1	24.5
	8	300 46.8	24.5
	9	315 46.5	•• 24.6
	10	330 46.2	24.6
	11	345 45.9	24.7
	12	0 45.6	−23 24.8
	13	15 45.3	24.8
	14	30 45.0	24.9
	15	45 44.6	•• 24.9
	16	60 44.3	25.0
	17	75 44.0	25.0
	18	90 43.7	−23 25.1
	19	105 43.4	25.1
	20	120 43.1	25.2
	21	135 42.8	•• 25.2
	22	150 42.5	25.3
	23	165 42.2	25.3
20	0	180 41.9	−23 25.4
	1	195 41.5	25.4
	2	210 41.2	25.5
	3	225 40.9	•• 25.5
	4	240 40.6	25.6
	5	255 40.3	25.6
	6	270 40.0	−23 25.6
	7	285 39.7	25.7
	8	300 39.4	25.7
	9	315 39.1	•• 25.8
	10	330 38.8	25.8
	11	345 38.4	25.8
	12	0 38.1	−23 25.9
	13	15 37.8	25.9
	14	30 37.5	26.0
	15	45 37.2	•• 26.0
	16	60 36.9	26.0
	17	75 36.6	26.1
	18	90 36.3	−23 26.1
	19	105 36.0	26.1
	20	120 35.6	26.1
	21	135 35.3	•• 26.2
	22	150 35.0	26.2
	23	165 34.7	26.2
	24	180 34.4	−23 26.3
code		—	0

STARS No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.2	−40 29.1
5	Achernar	335 58.9	−57 28.0
30	Acrux	173 58.6	−62 50.8
19	Adhara	255 46.6	−28 54.5
10	Aldebaran	291 39.4	+16 25.3
32	Alioth	166 59.1	+56 11.9
34	Alkaid	153 33.5	+49 31.9
55	Al Na'ir	28 38.8	−47 10.9
15	Alnilam	276 30.5	− 1 13.7
25	Alphard	218 38.9	− 8 27.8
41	Alphecca	126 48.4	+26 51.8
1	Alpheratz	358 28.9	+28 50.8
51	Altair	62 51.3	+ 8 45.0
2	Ankaa	353 58.7	−42 33.1
42	Antares	113 20.4	−26 20.0
37	Arcturus	146 35.9	+19 24.8
43	Atria	109 02.2	−68 56.8
22	Avior	234 35.5	−59 21.7
13	Bellatrix	279 18.7	+ 6 18.7
16	Betelg'se	271 48.4	+ 7 24.0
17	Canopus	264 15.1	−52 40.2
12	Capella	281 38.8	+45 57.3
53	Deneb	50 01.8	+45 07.4
28	Denebola	183 18.3	+14 49.2
4	Diphda	349 39.7	−18 14.0
27	Dubhe	194 45.1	+61 59.3
14	Elnath	279 07.7	+28 34.3
47	Eltanin	91 07.1	+51 29.6
54	Enif	34 30.3	+ 9 40.2
56	Fomalhaut	16 12.3	−29 51.7
31	Gacrux	172 50.0	−56 51.5
29	Gienah	176 37.5	−17 17.5
35	Hadar	149 50.6	−60 09.3
6	Hamal	328 50.1	+23 15.2
48	Kaus Aust.	84 42.3	−34 24.5
40	Kochab	137 18.7	+74 20.1
57	Markab	14 22.1	+14 58.0
8	Menkar	315 00.6	+ 3 55.0
36	Menkent	148 59.6	−36 08.9
24	Miapl'dus	221 48.6	−69 31.7
9	Mirfak	309 42.8	+49 42.4
50	Nunki	76 53.0	−26 21.3
52	Peacock	54 28.6	−56 53.0
21	Pollux	244 20.9	+28 08.1
20	Procyon	245 45.3	+ 5 20.5
46	R'alhague	96 47.5	+12 35.5
26	Regulus	208 30.0	+12 11.1
11	Rigel	281 53.8	− 8 15.1
38	Rigil Kent.	140 52.2	−60 39.0
44	Sabik	103 03.2	−15 40.3
3	Schedar	350 30.5	+56 17.8
45	Shaula	97 21.9	−37 04.4
18	Sirius	259 12.0	−16 39.2
33	Spica	159 17.6	−10 55.6
23	Suhail	223 24.5	−43 14.9
49	Vega	81 09.1	+38 44.5
39	Zub'g'bi	137 54.2	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 18	19	20	21
°	h m	h m	h m	h m	h m	h m
N 72	■	6 52	2 09	4 10	6 44	■
70	■	6 43	1 57	3 46	5 47	■
68	■	6 36	1 48	3 28	5 13	7 14
66	10 33	6 30	1 40	3 13	4 49	6 31
64	9 50	6 24	1 34	3 01	4 31	6 02
62	9 22	6 18	1 28	2 51	4 15	5 40
60	9 00	6 14	1 23	2 43	4 03	5 22
58	8 43	6 09	1 19	2 35	3 52	5 07
56	8 28	6 06	1 15	2 29	3 42	4 55
54	8 15	6 02	1 12	2 23	3 34	4 44
52	8 04	5 58	1 09	2 18	3 27	4 34
50	7 54	5 54	1 06	2 13	3 20	4 26
45	7 34	5 46	1 00	2 03	3 05	4 07
40	7 17	5 38	0 55	1 54	2 54	3 53
35	7 03	5 31	0 51	1 47	2 44	3 40
30	6 50	5 24	0 47	1 41	2 35	3 29
20	6 29	5 10	0 40	1 30	2 20	3 11
10	6 11	4 55	0 35	1 20	2 07	2 55
0	5 53	4 38	0 29	1 12	1 55	2 40
10	5 36	4 17	0 24	1 03	1 43	2 25
20	5 17	3 52	0 19	0 54	1 30	2 09
30	4 55	3 17	0 12	0 43	1 15	1 51
35	4 42	2 54	0 09	0 37	1 07	1 40
40	4 26	2 23	0 05	0 30	0 58	1 28
45	4 08	1 35	0 00	0 22	0 46	1 14
50	3 46	////	24 13	0 13	0 33	0 57
52	3 35	////	24 08	0 08	0 27	0 49
54	3 23	////	24 04	0 04	0 20	0 40
56	3 08	////	23 58	24 12	0 12	0 30
58	2 52	////	23 52	24 04	0 04	0 19
S 60	2 31	////	23 46	23 54	24 06	0 06

Lat.	Sunset	Twlt. ends	Moonset 18	19	20	21
°	h m	h m	h m	h m	h m	h m
N 72	■	17 00	10 45	10 13	9 10	■
70	■	17 09	10 59	10 39	10 09	■
68	■	17 16	11 10	10 59	10 43	10 17
66	13 21	17 24	11 20	11 14	11 08	11 01
64	14 03	17 29	11 28	11 27	11 28	11 31
62	14 32	17 35	11 35	11 38	11 44	11 53
60	14 53	17 39	11 41	11 48	11 57	12 11
58	15 11	17 44	11 46	11 56	12 09	12 26
56	15 26	17 48	11 50	12 03	12 19	12 39
54	15 38	17 51	11 55	12 10	12 28	12 51
52	15 49	17 55	11 59	12 16	12 36	13 01
50	15 59	17 59	12 02	12 21	12 43	13 10
45	16 20	18 07	12 10	12 33	12 59	13 29
40	16 37	18 15	12 16	12 42	13 11	13 44
35	16 51	18 22	12 22	12 51	13 22	13 58
30	17 03	18 29	12 27	12 58	13 32	14 09
20	17 25	18 44	12 35	13 11	13 48	14 29
10	17 43	18 58	12 43	13 22	14 03	14 46
0	18 01	19 16	12 50	13 32	14 16	15 02
10	18 18	19 36	12 57	13 43	14 30	15 18
20	18 37	20 01	13 04	13 54	14 44	15 36
30	18 59	20 36	13 13	14 07	15 01	15 56
35	19 12	20 59	13 18	14 14	15 11	16 07
40	19 27	21 30	13 24	14 23	15 22	16 21
45	19 45	22 18	13 30	14 33	15 35	16 37
50	20 08	////	13 38	14 45	15 51	16 57
52	20 19	////	13 42	14 51	15 59	17 06
54	20 31	////	13 46	14 57	16 07	17 17
56	20 45	////	13 51	15 04	16 17	17 28
58	21 02	////	13 56	15 12	16 28	17 42
S 60	21 23	////	14 01	15 21	16 40	17 59

Equation of Time (App.—Mean)

GMT	18	19	20
h	m s	m s	m s
0	+ 3 47.3	+ 3 17.8	+ 2 48.1
6	+ 3 39.9	+ 3 10.3	+ 2 40.6
12	+ 3 32.5	+ 3 02.9	+ 2 33.1
18	+ 3 25.1	+ 2 55.5	+ 2 25.7
24	+ 3 17.8	+ 2 48.1	+ 2 18.2

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
18	6 39	9 18	17 01	2 18	9 15
19	7 22	9 16	17 00	2 13	9 12
20	8 06	9 14	16 59	2 09	9 08
21	8 51	9 12	16 58	2 05	9 04

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.6	0.4	0.1
30			
	0.6	0.3	0.1
45			
	0.6	0.2	0.1
60			
	0.6	0.1	0.0
75			
	0.6	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	18	19	20
°	′	′	′
0			
	12.5	12.1	11.9
4			
	12.5	12.1	11.9
8			
	12.5	12.2	11.9
12			
	12.6	12.2	11.9
16			
	12.6	12.2	12.0
20			
	12.7	12.3	12.1
24			
	12.7	12.4	12.2
28			
	12.8	12.5	12.2
32			
	12.9	12.6	12.4
36			
	13.0	12.7	12.5
40			
	13.1	12.8	12.6
44			
	13.2	12.9	12.7
48			
	13.4	13.1	12.9
52			
	13.5	13.2	13.1
56			
	13.6	13.4	13.2
60			
	13.8	13.5	13.4
64			
	13.9	13.7	13.6
68			
	14.1	13.9	13.8
72			
	14.2	14.1	14.0
76			
	14.4	14.3	14.2
80			
	14.6	14.4	14.4
84			
	14.7	14.6	14.6
88			
	14.9	14.8	14.7
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	18	19	20
°	′	′	′
0			
	17.3	17.5	17.7
4			
	17.3	17.5	17.6
8			
	17.3	17.5	17.6
12			
	17.2	17.4	17.6
16			
	17.2	17.4	17.5
20			
	17.1	17.3	17.5
24			
	17.1	17.2	17.4
28			
	17.0	17.2	17.3
32			
	16.9	17.1	17.2
36			
	16.8	16.9	17.0
40			
	16.7	16.8	16.9
44			
	16.6	16.7	16.8
48			
	16.4	16.6	16.6
52			
	16.3	16.4	16.5
56			
	16.2	16.2	16.3
60			
	16.0	16.1	16.1
64			
	15.9	15.9	15.9
68			
	15.7	15.7	15.8
72			
	15.6	15.6	15.6
76			
	15.4	15.4	15.4
80			
	15.2	15.2	15.2
84			
	15.1	15.0	15.0
88			
	14.9	14.9	14.8
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −4.4 GHA	VENUS Dec.	MARS 0.8 GHA	MARS Dec.	JUPITER −2.2 GHA	JUPITER Dec.	SATURN 0.8 GHA	SATURN Dec.	MOON GHA	code	MOON Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
21 0	89 01.8	221 44.3	−14 14.7	105 23.1	− 7 52.9	328 44.9	+20 53.1	223 33.7	−14 54.8	231 23.2	133	−19 21.0	− 78
1	104 04.3	236 45.4	14.9	120 23.9	52.2	343 47.6	53.2	238 35.9	54.8	245 55.5	132	19 28.8	− 77
2	119 06.7	251 46.6	15.0	135 24.7	51.4	358 50.4	53.3	253 38.1	54.9	260 27.7	132	19 36.5	− 75
3	134 09.2	266 47.7	·· 15.2	150 25.5	·· 50.7	13 53.1	·· 53.3	268 40.4	·· 55.0	274 59.9	131	·19 44.0	− 75
4	149 11.6	281 48.8	15.3	165 26.3	50.0	28 55.8	53.4	283 42.6	55.0	289 32.0	131	19 51.5	− 75
5	164 14.1	296 49.9	15.4	180 27.1	49.2	43 58.6	53.4	298 44.8	55.1	304 04.1	130	19 59.0	− 73
6	179 16.6	311 51.1	−14 15.6	195 27.9	− 7 48.5	59 01.3	+20 53.5	313 47.0	−14 55.2	318 36.1	130	−20 06.3	− 72
7	194 19.0	326 52.2	15.7	210 28.8	47.8	74 04.0	53.6	328 49.2	55.2	333 08.1	130	20 13.5	− 72
8	209 21.5	341 53.3	15.9	225 29.6	47.0	89 06.8	53.6	343 51.4	55.3	347 40.1	129	20 20.7	− 71
9	224 24.0	356 54.4	·· 16.0	240 30.4	·· 46.3	104 09.5	·· 53.7	358 53.7	·· 55.3	2 12.0	128	·20 27.8	− 69
10	239 26.4	11 55.5	16.2	255 31.2	45.5	119 12.3	53.7	13 55.9	55.4	16 43.8	128	20 34.7	− 69
11	254 28.9	26 56.6	16.3	270 32.0	44.8	134 15.0	53.8	28 58.1	55.5	31 15.6	127	20 41.6	− 68
12	269 31.4	41 57.7	−14 16.5	285 32.8	− 7 44.1	149 17.7	+20 53.8	44 00.3	−14 55.5	45 47.3	127	−20 48.4	− 67
13	284 33.8	56 58.8	16.6	300 33.6	43.3	164 20.5	53.9	59 02.5	55.6	60 19.0	126	20 55.1	− 67
14	299 36.3	71 59.9	16.8	315 34.5	42.6	179 23.2	54.0	74 04.7	55.7	74 50.6	126	21 01.8	− 65
15	314 38.8	87 01.0	·· 16.9	330 35.3	·· 41.9	194 25.9	·· 54.0	89 06.9	·· 55.7	89 22.2	126	·21 08.3	− 64
16	329 41.2	102 02.1	17.1	345 36.1	41.1	209 28.7	54.1	104 09.2	55.8	103 53.8	125	21 14.7	− 64
17	344 43.7	117 03.2	17.3	0 36.9	40.4	224 31.4	54.1	119 11.4	55.9	118 25.3	124	21 21.1	− 62
18	359 46.1	132 04.3	−14 17.4	15 37.7	− 7 39.6	239 34.1	+20 54.2	134 13.6	−14 55.9	132 56.7	124	−21 27.3	− 62
19	14 48.6	147 05.4	17.6	30 38.5	38.9	254 36.9	54.3	149 15.8	56.0	147 28.1	123	21 33.5	− 60
20	29 51.1	162 06.4	17.7	45 39.3	38.2	269 39.6	54.3	164 18.0	56.1	161 59.4	123	21 39.5	− 60
21	44 53.5	177 07.5	·· 17.9	60 40.2	·· 37.4	284 42.4	·· 54.4	179 20.2	·· 56.1	176 30.7	123	·21 45.5	− 59
22	59 56.0	192 08.6	18.1	75 41.0	36.7	299 45.1	54.4	194 22.5	56.2	191 02.0	122	21 51.4	− 57
23	74 58.5	207 09.7	18.2	90 41.8	36.0	314 47.8	54.5	209 24.7	56.3	205 33.2	121	21 57.1	− 57
22 0	90 00.9	222 10.7	−14 18.4	105 42.6	− 7 35.2	329 50.6	+20 54.6	224 26.9	−14 56.3	220 04.3	121	−22 02.8	− 56
1	105 03.4	237 11.8	18.6	120 43.4	34.5	344 53.3	54.6	239 29.1	56.4	234 35.4	121	22 08.4	− 54
2	120 05.9	252 12.9	18.7	135 44.2	33.7	359 56.0	54.7	254 31.3	56.4	249 06.5	120	22 13.8	− 54
3	135 08.3	267 13.9	·· 18.9	150 45.1	·· 33.0	14 58.8	·· 54.7	269 33.5	·· 56.5	263 37.5	119	·22 19.2	− 53
4	150 10.8	282 15.0	19.1	165 45.9	32.3	30 01.5	54.8	284 35.8	56.6	278 08.4	119	22 24.5	− 52
5	165 13.2	297 16.1	19.2	180 46.7	31.5	45 04.3	54.9	299 38.0	56.6	292 39.3	119	22 29.7	− 50
6	180 15.7	312 17.1	−14 19.4	195 47.5	− 7 30.8	60 07.0	+20 54.9	314 40.2	−14 56.7	307 10.2	118	−22 34.7	− 50
7	195 18.2	327 18.2	19.6	210 48.3	30.0	75 09.7	55.0	329 42.4	56.8	321 41.0	118	22 39.7	− 49
8	210 20.6	342 19.2	19.8	225 49.1	29.3	90 12.5	55.0	344 44.6	56.8	336 11.8	117	22 44.6	− 47
9	225 23.1	357 20.3	·· 19.9	240 49.9	·· 28.6	105 15.2	·· 55.1	359 46.8	·· 56.9	350 42.5	117	·22 49.3	− 47
10	240 25.6	12 21.3	20.1	255 50.8	27.8	120 18.0	55.2	14 49.1	57.0	5 13.2	116	22 54.0	− 46
11	255 28.0	27 22.4	20.3	270 51.6	27.1	135 20.7	55.2	29 51.3	57.0	19 43.8	116	22 58.6	− 44
12	270 30.5	42 23.4	−14 20.5	285 52.4	− 7 26.3	150 23.5	+20 55.3	44 53.5	−14 57.1	34 14.4	116	−23 03.0	− 44
13	285 33.0	57 24.5	20.7	300 53.2	25.6	165 26.2	55.3	59 55.7	57.2	48 45.0	115	23 07.4	− 42
14	300 35.4	72 25.5	20.8	315 54.0	24.9	180 28.9	55.4	74 57.9	57.2	63 15.5	114	23 11.6	− 41
15	315 37.9	87 26.5	·· 21.0	330 54.8	·· 24.1	195 31.7	·· 55.5	90 00.2	·· 57.3	77 45.9	115	·23 15.7	− 41
16	330 40.4	102 27.6	21.2	345 55.7	23.4	210 34.4	55.5	105 02.4	57.3	92 16.4	113	23 19.8	− 39
17	345 42.8	117 28.6	21.4	0 56.5	22.6	225 37.2	55.6	120 04.6	57.4	106 46.7	114	23 23.7	− 38
18	0 45.3	132 29.6	−14 21.6	15 57.3	− 7 21.9	240 39.9	+20 55.6	135 06.8	−14 57.5	121 17.1	113	−23 27.5	− 37
19	15 47.7	147 30.7	21.8	30 58.1	21.2	255 42.6	55.7	150 09.0	57.5	135 47.4	112	23 31.2	− 36
20	30 50.2	162 31.7	21.9	45 58.9	20.4	270 45.4	55.8	165 11.2	57.6	150 17.6	112	23 34.8	− 35
21	45 52.7	177 32.7	·· 22.1	60 59.7	·· 19.7	285 48.1	·· 55.8	180 13.5	·· 57.7	164 47.8	112	·23 38.3	− 33
22	60 55.1	192 33.7	22.3	76 00.5	18.9	300 50.9	55.9	195 15.7	57.7	179 18.0	111	23 41.6	− 33
23	75 57.6	207 34.7	22.5	91 01.4	18.2	315 53.6	55.9	210 17.9	57.8	193 48.1	111	23 44.9	− 32
23 0	91 00.1	222 35.8	−14 22.7	106 02.2	− 7 17.5	330 56.4	+20 56.0	225 20.1	−14 57.9	208 18.2	111	−23 48.1	− 30
1	106 02.5	237 36.8	22.9	121 03.0	16.7	345 59.1	56.1	240 22.3	57.9	222 48.3	110	23 51.1	− 29
2	121 05.0	252 37.8	23.1	136 03.8	16.0	1 01.9	56.1	255 24.6	58.0	237 18.3	110	23 54.0	− 28
3	136 07.5	267 38.8	·· 23.3	151 04.6	·· 15.2	16 04.6	·· 56.2	270 26.8	·· 58.0	251 48.3	110	·23 56.8	− 28
4	151 09.9	282 39.8	23.5	166 05.4	14.5	31 07.3	56.2	285 29.0	58.1	266 18.3	109	23 59.6	− 25
5	166 12.4	297 40.8	23.7	181 06.3	13.8	46 10.1	56.3	300 31.2	58.2	280 48.2	109	24 02.1	− 25
6	181 14.9	312 41.8	−14 23.9	196 07.1	− 7 13.0	61 12.8	+20 56.4	315 33.4	−14 58.2	295 18.1	108	−24 04.6	− 24
7	196 17.3	327 42.8	24.1	211 07.9	12.3	76 15.6	56.4	330 35.6	58.3	309 47.9	108	24 07.0	− 22
8	211 19.8	342 43.8	24.3	226 08.7	11.5	91 18.3	56.5	345 37.9	58.4	324 17.7	108	24 09.2	− 22
9	226 22.2	357 44.8	·· 24.5	241 09.5	·· 10.8	106 21.1	·· 56.5	0 40.1	·· 58.4	338 47.5	108	·24 11.4	− 20
10	241 24.7	12 45.8	24.7	256 10.3	10.0	121 23.8	56.6	15 42.3	58.5	353 17.3	107	24 13.4	− 19
11	256 27.2	27 46.7	24.9	271 11.2	09.3	136 26.6	56.7	30 44.5	58.6	7 47.0	107	24 15.3	− 18
12	271 29.6	42 47.7	−14 25.1	286 12.0	− 7 08.6	151 29.3	+20 56.7	45 46.7	−14 58.6	22 16.7	107	−24 17.1	− 16
13	286 32.1	57 48.7	25.3	301 12.8	07.8	166 32.1	56.8	60 49.0	58.7	36 46.4	106	24 18.7	− 16
14	301 34.6	72 49.7	25.5	316 13.6	07.1	181 34.8	56.8	75 51.2	58.7	51 16.0	106	24 20.3	− 14
15	316 37.0	87 50.7	·· 25.7	331 14.4	·· 06.3	196 37.6	·· 56.9	90 53.4	·· 58.8	65 45.6	106	·24 21.7	− 13
16	331 39.5	102 51.7	25.9	346 15.2	05.6	211 40.3	57.0	105 55.6	58.9	80 15.2	106	24 23.0	− 12
17	346 42.0	117 52.6	26.1	1 16.1	04.8	226 43.1	57.0	120 57.8	58.9	94 44.8	105	24 24.2	− 11
18	1 44.4	132 53.6	−14 26.3	16 16.9	− 7 04.1	241 45.8	+20 57.1	136 00.1	−14 59.0	109 14.3	105	−24 25.3	− 10
19	16 46.9	147 54.6	26.5	31 17.7	03.4	256 48.6	57.1	151 02.3	59.1	123 43.8	105	24 26.3	− 8
20	31 49.4	162 55.5	26.8	46 18.5	02.6	271 51.3	57.2	166 04.5	59.1	138 13.3	105	24 27.1	− 7
21	46 51.8	177 56.5	·· 27.0	61 19.3	·· 01.9	286 54.1	·· 57.3	181 06.7	·· 59.2	152 42.8	104	·24 27.8	− 7
22	61 54.3	192 57.5	27.2	76 20.2	01.1	301 56.8	57.3	196 09.0	59.2	167 12.2	105	24 28.5	− 4
23	76 56.7	207 58.4	27.4	91 21.0	7 00.4	316 59.6	57.4	211 11.2	59.3	181 41.7	104	24 28.9	− 4
24	91 59.2	222 59.4	−14 27.6	106 21.8	− 6 59.7	332 02.3	+20 57.5	226 13.4	−14 59.4	196 11.1	104	−24 29.3	− 3
code	–	+ 11	− 2	+ 8	+ 7	+ 27	0	+ 22	− 1				

GMT		SUN GHA	SUN Dec.
d	h	° ′	° ′
21	0	180 34.4	−23 26.3
	1	195 34.1	26.3
	2	210 33.8	26.3
	3	225 33.5 ··	26.3
	4	240 33.1	26.4
	5	255 32.8	26.4
	6	270 32.5	−23 26.4
	7	285 32.2	26.4
	8	300 31.9	26.5
	9	315 31.6 ··	26.5
	10	330 31.3	26.5
	11	345 31.0	26.5
	12	0 30.7	−23 26.5
	13	15 30.3	26.6
	14	30 30.0	26.6
	15	45 29.7 ··	26.6
	16	60 29.4	26.6
	17	75 29.1	26.6
	18	90 28.8	−23 26.6
	19	105 28.5	26.6
	20	120 28.2	26.6
	21	135 27.9 ··	26.7
	22	150 27.5	26.7
	23	165 27.2	26.7
22	0	180 26.9	−23 26.7
	1	195 26.6	26.7
	2	210 26.3	26.7
	3	225 26.0 ··	26.7
	4	240 25.7	26.7
	5	255 25.4	26.7
	6	270 25.0	−23 26.7
	7	285 24.7	26.7
	8	300 24.4	26.7
	9	315 24.1 ··	26.7
	10	330 23.8	26.7
	11	345 23.5	26.7
	12	0 23.2	−23 26.7
	13	15 22.9	26.7
	14	30 22.5	26.7
	15	45 22.2 ··	26.7
	16	60 21.9	26.7
	17	75 21.6	26.7
	18	90 21.3	−23 26.7
	19	105 21.0	26.7
	20	120 20.7	26.7
	21	135 20.4 ··	26.7
	22	150 20.0	26.7
	23	165 19.7	26.6
23	0	180 19.4	−23 26.6
	1	195 19.1	26.6
	2	210 18.8	26.6
	3	225 18.5 ··	26.6
	4	240 18.2	26.6
	5	255 17.9	26.6
	6	270 17.5	−23 26.5
	7	285 17.2	26.5
	8	300 16.9	26.5
	9	315 16.6 ··	26.5
	10	330 16.3	26.5
	11	345 16.0	26.4
	12	0 15.7	−23 26.4
	13	15 15.4	26.4
	14	30 15.0	26.4
	15	45 14.7 ··	26.4
	16	60 14.4	26.3
	17	75 14.1	26.3
	18	90 13.8	−23 26.3
	19	105 13.5	26.3
	20	120 13.2	26.2
	21	135 12.9 ··	26.2
	22	150 12.5	26.2
	23	165 12.2	26.1
	24	180 11.9	−23 26.1
code		—	0

STARS

No.	Name	SHA ° ′	Dec. ° ′
7	Acamar	315 51.2	−40 29.1
5	Achernar	335 58.9	−57 28.0
30	Acrux	173 58.6	−62 50.8
19	Adhara	255 46.6	−28 54.6
10	Aldebaran	291 39.4	+16 25.3
32	Alioth	166 59.1	+56 11.9
34	Alkaid	153 33.5	+49 31.9
55	Al Na'ir	28 38.8	−47 10.9
15	Alnilam	276 30.5	− 1 13.7
25	Alphard	218 38.9	− 8 27.8
41	Alphecca	126 48.4	+26 51.7
1	Alpheratz	358 28.9	+28 50.8
51	Altair	62 51.3	+ 8 45.0
2	Ankaa	353 58.7	−42 33.1
42	Antares	113 20.4	−26 20.0
37	Arcturus	146 35.9	+19 24.8
43	Atria	109 02.2	−68 56.8
22	Avior	234 35.5	−59 21.7
13	Bellatrix	279 18.7	+ 6 18.7
16	Betelg'se	271 48.4	+ 7 24.0
17	Canopus	264 15.1	−52 40.2
12	Capella	281 38.8	+45 57.3
53	Deneb	50 01.8	+45 07.3
28	Denebola	183 18.3	+14 49.2
4	Diphda	349 39.7	−18 14.0
27	Dubhe	194 45.0	+61 59.3
14	Elnath	279 07.6	+28 34.3
47	Eltanin	91 07.1	+51 29.6
54	Enif	34 30.3	+ 9 40.2
56	Fomalhaut	16 12.3	−29 51.7
31	Gacrux	172 50.0	−56 51.5
29	Gienah	176 37.5	−17 17.5
35	Hadar	149 50.6	−60 09.3
6	Hamal	328 50.1	+23 15.2
48	Kaus Aust.	84 42.3	−34 24.5
40	Kochab	137 18.7	+74 20.0
57	Markab	14 22.1	+14 58.0
8	Menkar	315 00.7	+ 3 55.0
36	Menkent	148 59.6	−36 08.9
24	Miapl'dus	221 48.6	−69 31.7
9	Mirfak	309 42.8	+49 42.4
50	Nunki	76 52.9	−26 21.3
52	Peacock	54 28.6	−56 53.0
21	Pollux	244 20.9	+28 08.1
20	Procyon	245 45.3	+ 5 20.5
46	R'alhague	96 47.5	+12 35.5
26	Regulus	208 29.9	+12 11.1
11	Rigel	281 53.8	− 8 15.1
38	Rigil Kent.	140 52.2	−60 39.0
44	Sabik	103 03.2	−15 40.3
3	Schedar	350 30.6	+56 17.8
45	Shaula	97 21.9	−37 04.4
18	Sirius	259 12.0	−16 39.2
33	Spica	159 17.6	−10 55.7
23	Suhail	223 24.4	−43 14.9
49	Vega	81 09.1	+38 44.5
39	Zub'g'bi	137 54.2	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 21	Moonrise 22	Moonrise 23	Moonrise 24
°	h m	h m	h m	h m	h m	h m
N 72	■	6 54	■	■	■	■
70	■	6 45	■	■	■	■
68	■	6 37	7 14	■	■	■
66	10 35	6 31	6 31	8 21	■	■
64	9 52	6 26	6 02	7 32	8 55	9 53
62	9 24	6 20	5 40	7 02	8 15	9 11
60	9 02	6 16	5 22	6 39	7 48	8 42
58	8 45	6 11	5 07	6 20	7 26	8 20
56	8 30	6 07	4 55	6 05	7 09	8 02
54	8 17	6 03	4 44	5 51	6 54	7 47
52	8 06	5 59	4 34	5 40	6 41	7 34
50	7 56	5 56	4 26	5 30	6 29	7 22
45	7 35	5 48	4 07	5 08	6 06	6 59
40	7 18	5 40	3 53	4 51	5 47	6 39
35	7 04	5 33	3 40	4 36	5 31	6 23
30	6 52	5 25	3 29	4 24	5 18	6 09
20	6 31	5 11	3 11	4 03	4 54	5 46
10	6 12	4 57	2 55	3 44	4 34	5 25
0	5 55	4 39	2 40	3 27	4 16	5 06
10	5 37	4 18	2 25	3 10	3 57	4 47
20	5 18	3 53	2 09	2 51	3 37	4 27
30	4 56	3 18	1 51	2 30	3 14	4 03
35	4 43	2 55	1 40	2 18	3 01	3 49
40	4 28	2 24	1 28	2 04	2 45	3 33
45	4 10	1 36	1 14	1 47	2 27	3 14
50	3 47	////	0 57	1 27	2 04	2 50
52	3 36	////	0 49	1 17	1 53	2 39
54	3 24	////	0 40	1 06	1 41	2 26
56	3 10	////	0 30	0 54	1 27	2 11
58	2 53	////	0 19	0 40	1 10	1 53
S 60	2 32	////	0 06	0 23	0 50	1 31

Lat.	Sunset	Twlt. ends	Moonset 21	Moonset 22	Moonset 23	Moonset 24
°	h m	h m	h m	h m	h m	h m
N 72	■	17 01	■	■	■	■
70	■	17 10	■	■	■	■
68	■	17 18	10 17	■	■	■
66	13 21	17 24	11 01	10 49	■	■
64	14 04	17 30	11 31	11 38	11 57	12 45
62	14 33	17 36	11 53	12 09	12 38	13 27
60	14 54	17 40	12 11	12 32	13 06	13 56
58	15 12	17 45	12 26	12 51	13 27	14 18
56	15 27	17 49	12 39	13 07	13 45	14 36
54	15 40	17 54	12 51	13 21	14 00	14 51
52	15 51	17 57	13 01	13 32	14 13	15 04
50	16 01	18 01	13 10	13 43	14 24	15 15
45	16 21	18 08	13 29	14 05	14 48	15 39
40	16 38	18 16	13 44	14 23	15 07	15 58
35	16 52	18 23	13 58	14 38	15 23	16 14
30	17 05	18 31	14 09	14 51	15 37	16 28
20	17 26	18 45	14 29	15 13	16 01	16 52
10	17 45	19 00	14 46	15 32	16 21	17 12
0	18 02	19 17	15 02	15 50	16 40	17 31
10	18 20	19 38	15 18	16 08	16 59	17 50
20	18 39	20 03	15 36	16 28	17 19	18 10
30	19 01	20 38	15 56	16 50	17 43	18 33
35	19 14	21 01	16 07	17 03	17 57	18 47
40	19 29	21 32	16 21	17 18	18 13	19 02
45	19 47	22 20	16 37	17 36	18 32	19 21
50	20 09	////	16 57	17 59	18 55	19 45
52	20 20	////	17 06	18 09	19 07	19 56
54	20 33	////	17 17	18 22	19 20	20 08
56	20 47	////	17 28	18 36	19 35	20 23
58	21 04	////	17 42	18 52	19 53	20 40
S 60	21 24	////	17 59	19 12	20 14	21 01

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
30	0.6	0.3	0.1
45	0.6	0.3	0.1
60	0.6	0.2	0.1
75	0.6	0.1	0.0
90	0.6	0.0	0.0

Moon's Lower Limb **Add**

Alt.	21	22	23
°	′	′	′
0	11.7	11.9	12.1
4	11.7	11.9	12.1
8	11.8	11.9	12.2
12	11.8	11.9	12.2
16	11.9	12.0	12.2
20	12.0	12.1	12.3
24	12.0	12.2	12.4
28	12.1	12.2	12.5
32	12.2	12.4	12.6
36	12.4	12.5	12.7
40	12.5	12.6	12.8
44	12.6	12.7	12.9
48	12.8	12.9	13.1
52	13.0	13.1	13.2
56	13.1	13.2	13.4
60	13.3	13.4	13.5
64	13.5	13.6	13.7
68	13.7	13.8	13.9
72	13.9	14.0	14.1
76	14.1	14.2	14.3
80	14.3	14.4	14.4
84	14.5	14.6	14.6
88	14.7	14.7	14.8
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	21	22	23
°	′	′	′
0	17.7	17.7	17.5
4	17.7	17.6	17.5
8	17.7	17.6	17.5
12	17.6	17.6	17.4
16	17.6	17.5	17.4
20	17.5	17.5	17.3
24	17.4	17.4	17.2
28	17.3	17.3	17.2
32	17.2	17.2	17.1
36	17.1	17.0	16.9
40	17.0	16.9	16.8
44	16.8	16.8	16.7
48	16.7	16.6	16.6
52	16.5	16.5	16.4
56	16.3	16.3	16.2
60	16.1	16.1	16.1
64	16.0	15.9	15.9
68	15.8	15.8	15.7
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.2	15.2	15.2
84	14.9	15.0	15.0
88	14.8	14.8	14.9
90			

Subtract from table, back cover

Equation of Time (App.—Mean)

GMT	21	22	23
h	m s	m s	m s
0	+ 2 18.2	+ 1 48.3	+ 1 18.3
6	+ 2 10.7	+ 1 40.8	+ 1 10.8
12	+ 2 03.3	+ 1 33.3	+ 1 03.3
18	+ 1 55.8	+ 1 25.8	+ 0 55.8
24	+ 1 48.3	+ 1 18.3	+ 0 48.3

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
21	8 51	9 12	16 58	2 05	9 04
22	9 38	9 11	16 56	2 00	9 01
23	10 28	9 09	16 55	1 56	8 57
24	11 18	9 08	16 54	1 52	8 54

GMT		♈ GHA	VENUS −4.3 GHA	Dec.	MARS 0.8 GHA	Dec.	JUPITER −2.2 GHA	Dec.	SATURN 0.8 GHA	Dec.	MOON GHA	code	Dec.	code
	h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
24	0	91 59.2	222 59.4	−14 27.6	106 21.8	− 6 59.7	332 02.3	+20 57.5	226 13.4	−14 59.4	196 11.1	104	−24 29.3	− 3
	1	107 01.7	238 00.3	27.8	121 22.6	58.9	347 05.1	57.5	241 15.6	59.4	210 40.5	104	24 29.6	− 1
	2	122 04.1	253 01.3	28.1	136 23.4	58.2	2 07.8	57.6	256 17.8	59.5	225 09.9	103	24 29.7	0
	3	137 06.6	268 02.2	·· 28.3	151 24.2	·· 57.4	17 10.6	·· 57.6	271 20.1	·· 59.6	239 39.2	104	·24 29.7	+ 1
	4	152 09.1	283 03.2	28.5	166 25.1	56.7	32 13.3	57.7	286 22.3	59.6	254 08.6	103	24 29.6	+ 3
	5	167 11.5	298 04.1	28.7	181 25.9	55.9	47 16.1	57.8	301 24.5	59.7	268 37.9	103	24 29.3	+ 3
	6	182 14.0	313 05.1	−14 28.9	196 26.7	− 6 55.2	62 18.8	+20 57.8	316 26.7	−14 59.7	283 07.2	103	−24 29.0	+ 5
	7	197 16.5	328 06.0	29.2	211 27.5	54.5	77 21.6	57.9	331 28.9	59.8	297 36.5	103	24 28.5	+ 6
	8	212 18.9	343 07.0	29.4	226 28.3	53.7	92 24.3	57.9	346 31.2	59.9	312 05.8	103	24 27.9	+ 7
	9	227 21.4	358 07.9	·· 29.6	241 29.1	·· 53.0	107 27.1	·· 58.0	1 33.4	·14 59.9	326 35.1	103	·24 27.2	+ 8
	10	242 23.8	13 08.8	29.8	256 30.0	52.2	122 29.8	58.1	16 35.6	15 00.0	341 04.4	103	24 26.4	+ 10
	11	257 26.3	28 09.8	30.1	271 30.8	51.5	137 32.6	58.1	31 37.8	00.1	355 33.7	102	24 25.4	+ 11
	12	272 28.8	43 10.7	−14 30.3	286 31.6	− 6 50.7	152 35.3	+20 58.2	46 40.1	−15 00.1	10 02.9	103	−24 24.3	+ 12
	13	287 31.2	58 11.6	30.5	301 32.4	50.0	167 38.1	58.3	61 42.3	00.2	24 32.2	102	24 23.1	+ 13
	14	302 33.7	73 12.5	30.7	316 33.2	49.2	182 40.8	58.3	76 44.5	00.2	39 01.4	103	24 21.8	+ 15
	15	317 36.2	88 13.5	·· 31.0	331 34.1	·· 48.5	197 43.6	·· 58.4	91 46.7	·· 00.3	53 30.7	102	·24 20.3	+ 15
	16	332 38.6	103 14.4	31.2	346 34.9	47.8	212 46.3	58.4	106 48.9	00.4	67 59.9	102	24 18.8	+ 17
	17	347 41.1	118 15.3	31.4	1 35.7	47.0	227 49.1	58.5	121 51.2	00.4	82 29.1	103	24 17.1	+ 18
	18	2 43.6	133 16.2	−14 31.7	16 36.5	− 6 46.3	242 51.8	+20 58.6	136 53.4	−15 00.5	96 58.4	102	−24 15.3	+ 20
	19	17 46.0	148 17.1	31.9	31 37.3	45.5	257 54.6	58.6	151 55.6	00.6	111 27.6	103	24 13.3	+ 20
	20	32 48.5	163 18.1	32.1	46 38.1	44.8	272 57.3	58.7	166 57.8	00.6	125 56.9	102	24 11.3	+ 22
	21	47 51.0	178 19.0	·· 32.4	61 39.0	·· 44.0	288 00.1	·· 58.8	182 00.1	·· 00.7	140 26.1	102	·24 09.1	+ 23
	22	62 53.4	193 19.9	32.6	76 39.8	43.3	303 02.9	58.8	197 02.3	00.7	154 55.3	103	24 06.8	+ 24
	23	77 55.9	208 20.8	32.9	91 40.6	42.6	318 05.6	58.9	212 04.5	00.8	169 24.6	102	24 04.4	+ 25
25	0	92 58.3	223 21.7	−14 33.1	106 41.4	− 6 41.8	333 08.4	+20 58.9	227 06.7	−15 00.9	183 53.8	103	−24 01.9	+ 27
	1	108 00.8	238 22.6	33.3	121 42.2	41.1	348 11.1	59.0	242 08.9	00.9	198 23.1	102	23 59.2	+ 28
	2	123 03.3	253 23.5	33.6	136 43.1	40.3	3 13.9	59.1	257 11.2	01.0	212 52.3	103	23 56.4	+ 28
	3	138 05.7	268 24.4	·· 33.8	151 43.9	·· 39.6	18 16.6	·· 59.1	272 13.4	·· 01.0	227 21.6	103	·23 53.6	+ 31
	4	153 08.2	283 25.3	34.1	166 44.7	38.8	33 19.4	59.2	287 15.6	01.1	241 50.9	103	23 50.5	+ 31
	5	168 10.7	298 26.2	34.3	181 45.5	38.1	48 22.2	59.2	302 17.8	01.2				
	6	183 13.1	313 27.1	−14 34.5	196 46.3	− 6 37.3	63 24.9	+20 59.3	317 20.1	−15 01.2	Sun partially eclipsed Indian Ocean—Annular off South Africa to East Indies			
	7	198 15.6	328 27.9	34.8	211 47.2	36.6	78 27.7	59.4	332 22.3	01.3				
	8	213 18.1	343 28.8	35.0	226 48.0	35.8	93 30.4	59.4	347 24.5	01.4				
	9	228 20.5	358 29.7	·· 35.3	241 48.8	·· 35.1	108 33.2	·· 59.5	2 26.7	·· 01.4	314 17.4	103	·23 33.6	+ 37
	10	243 23.0	13 30.6	35.5	256 49.6	34.4	123 35.9	59.6	17 29.0	01.5	328 46.7	104	23 29.9	+ 38
	11	258 25.5	28 31.5	35.8	271 50.4	33.6	138 38.7	59.6	32 31.2	01.5	343 16.1	103	23 26.1	+ 40
	12	273 27.9	43 32.3	−14 36.0	286 51.3	− 6 32.9	153 41.5	+20 59.7	47 33.4	−15 01.6	357 45.4	104	−23 22.1	+ 41
	13	288 30.4	58 33.2	36.3	301 52.1	32.1	168 44.2	59.7	62 35.6	01.7	12 14.8	104	23 18.0	+ 42
	14	303 32.8	73 34.1	36.5	316 52.9	31.4	183 47.0	59.8	77 37.9	01.7	26 44.2	104	23 13.8	+ 43
	15	318 35.3	88 35.0	·· 36.8	331 53.7	·· 30.6	198 49.7	·· 59.9	92 40.1	·· 01.8	41 13.6	105	·23 09.5	+ 45
	16	333 37.8	103 35.8	37.0	346 54.5	29.9	213 52.5	20 59.9	107 42.3	01.8	55 43.1	104	23 05.0	+ 45
	17	348 40.2	118 36.7	37.3	1 55.4	29.1	228 55.3	21 00.0	122 44.5	01.9	70 12.5	105	23 00.5	+ 47
	18	3 42.7	133 37.6	−14 37.6	16 56.2	− 6 28.4	243 58.0	+21 00.1	137 46.8	−15 02.0	84 42.0	105	−22 55.8	+ 48
	19	18 45.2	148 38.4	37.8	31 57.0	27.6	259 00.8	00.1	152 49.0	02.0	99 11.5	105	22 51.0	+ 49
	20	33 47.6	163 39.3	38.1	46 57.8	26.9	274 03.5	00.2	167 51.2	02.1	113 41.0	105	22 46.1	+ 50
	21	48 50.1	178 40.1	·· 38.3	61 58.6	·· 26.2	289 06.3	·· 00.2	182 53.4	·· 02.2	128 10.5	106	·22 41.1	+ 52
	22	63 52.6	193 41.0	38.6	76 59.5	25.4	304 09.1	00.3	197 55.7	02.2	142 40.1	105	22 35.9	+ 52
	23	78 55.0	208 41.8	38.8	92 00.3	24.7	319 11.8	00.4	212 57.9	02.3	157 09.6	106	22 30.7	+ 54
26	0	93 57.5	223 42.7	−14 39.1	107 01.1	− 6 23.9	334 14.6	+21 00.4	228 00.1	−15 02.3	171 39.2	107	−22 25.3	+ 55
	1	109 00.0	238 43.5	39.4	122 01.9	23.2	349 17.3	00.5	243 02.3	02.4	186 08.9	106	22 19.8	+ 56
	2	124 02.4	253 44.4	39.6	137 02.7	22.4	4 20.1	00.6	258 04.6	02.5	200 38.5	107	22 14.2	+ 57
	3	139 04.9	268 45.2	·· 39.9	152 03.6	·· 21.7	19 22.9	·· 00.6	273 06.8	·· 02.5	215 08.2	107	·22 08.5	+ 58
	4	154 07.3	283 46.1	40.2	167 04.4	20.9	34 25.6	00.7	288 09.0	02.6	229 37.9	107	22 02.7	+ 60
	5	169 09.8	298 46.9	40.4	182 05.2	20.2	49 28.4	00.7	303 11.2	02.6	244 07.6	108	21 56.7	+ 60
	6	184 12.3	313 47.8	−14 40.7	197 06.0	− 6 19.4	64 31.1	+21 00.8	318 13.5	−15 02.7	258 37.4	107	−21 50.7	+ 61
	7	199 14.7	328 48.6	41.0	212 06.8	18.7	79 33.9	00.9	333 15.7	02.8	273 07.1	109	21 44.6	+ 63
	8	214 17.2	343 49.4	41.2	227 07.7	17.9	94 36.7	00.9	348 17.9	02.8	287 37.0	108	21 38.3	+ 64
	9	229 19.7	358 50.3	·· 41.5	242 08.5	·· 17.2	109 39.4	·· 01.0	3 20.1	·· 02.9	302 06.8	109	·21 31.9	+ 65
	10	244 22.1	13 51.1	41.8	257 09.3	16.5	124 42.2	01.1	18 22.4	02.9	316 36.7	109	21 25.4	+ 66
	11	259 24.6	28 51.9	42.0	272 10.1	15.7	139 45.0	01.1	33 24.6	03.0	331 06.6	109	21 18.8	+ 67
	12	274 27.1	43 52.7	−14 42.3	287 10.9	− 6 15.0	154 47.7	+21 01.2	48 26.8	−15 03.1	345 36.5	109	−21 12.1	+ 68
	13	289 29.5	58 53.6	42.6	302 11.8	14.2	169 50.5	01.3	63 29.0	03.1	0 06.4	110	21 05.3	+ 69
	14	304 32.0	73 54.4	42.8	317 12.6	13.5	184 53.3	01.3	78 31.3	03.2	14 36.4	111	20 58.4	+ 70
	15	319 34.5	88 55.2	·· 43.1	332 13.4	·· 12.7	199 56.0	·· 01.4	93 33.5	·· 03.2	29 06.5	110	·20 51.4	+ 71
	16	334 36.9	103 56.0	43.4	347 14.2	12.0	214 58.8	01.4	108 35.7	03.3	43 36.5	111	20 44.3	+ 73
	17	349 39.4	118 56.8	43.7	2 15.0	11.2	230 01.5	01.5	123 38.0	03.4	58 06.6	111	20 37.0	+ 73
	18	4 41.8	133 57.6	−14 43.9	17 15.9	− 6 10.5	245 04.3	+21 01.6	138 40.2	−15 03.4	72 36.7	112	−20 29.7	+ 75
	19	19 44.3	148 58.4	44.2	32 16.7	09.7	260 07.1	01.6	153 42.4	03.5	87 06.9	112	20 22.2	+ 75
	20	34 46.8	163 59.3	44.5	47 17.5	09.0	275 09.8	01.7	168 44.6	03.5	101 37.1	112	20 14.7	+ 77
	21	49 49.2	179 00.1	·· 44.8	62 18.3	·· 08.2	290 12.6	·· 01.8	183 46.9	·· 03.6	116 07.3	112	·20 07.0	+ 77
	22	64 51.7	194 00.9	45.1	77 19.1	07.5	305 15.4	01.8	198 49.1	03.7	130 37.5	113	19 59.3	+ 79
	23	79 54.2	209 01.7	45.3	92 20.0	06.7	320 18.1	01.9	213 51.3	03.7	145 07.8	113	19 51.4	+ 79
	24	94 56.6	224 02.5	−14 45.6	107 20.8	− 6 06.0	335 20.9	+21 01.9	228 53.6	−15 03.8	159 38.1	114	−19 43.5	+ 81
	code	—	+ 9	− 3	+ 8	+ 8	+ 27	0	+ 22	− 1				

GMT		SUN GHA	SUN Dec.
h		° ′	° ′
24	0	180 11.9	−23 26.1
	1	195 11.6	26.1
	2	210 11.3	26.0
	3	225 11.0	•• 26.0
	4	240 10.7	26.0
	5	255 10.4	25.9
	6	270 10.0	−23 25.9
	7	285 09.7	25.9
	8	300 09.4	25.8
	9	315 09.1	•• 25.8
	10	330 08.8	25.8
	11	345 08.5	25.7
	12	0 08.2	−23 25.7
	13	15 07.9	25.6
	14	30 07.5	25.6
	15	45 07.2	•• 25.5
	16	60 06.9	25.5
	17	75 06.6	25.5
	18	90 06.3	−23 25.4
	19	105 06.0	25.4
	20	120 05.7	25.3
	21	135 05.4	•• 25.3
	22	150 05.0	25.2
	23	165 04.7	25.2
25	0	180 04.4	−23 25.1
	1	195 04.1	25.1
	2	210 03.8	25.0
	3	225 03.5	•• 25.0
	4	240 03.2	24.9
	5	255 02.9	24.8
	6	270 02.5	−23 24.8
	7	285 02.2	24.7
	8	300 01.9	24.7
	9	315 01.6	•• 24.6
	10	330 01.3	24.6
	11	345 01.0	24.5
	12	0 00.7	−23 24.4
	13	15 00.4	24.4
	14	30 00.1	24.3
	15	44 59.7	•• 24.2
	16	59 59.4	24.2
	17	74 59.1	24.1
	18	89 58.8	−23 24.1
	19	104 58.5	24.0
	20	119 58.2	23.9
	21	134 57.9	•• 23.9
	22	149 57.6	23.8
	23	164 57.2	23.7
26	0	179 56.9	−23 23.6
	1	194 56.6	23.6
	2	209 56.3	23.5
	3	224 56.0	•• 23.4
	4	239 55.7	23.4
	5	254 55.4	23.3
	6	269 55.1	−23 23.2
	7	284 54.8	23.1
	8	299 54.4	23.1
	9	314 54.1	•• 23.0
	10	329 53.8	22.9
	11	344 53.5	22.8
	12	359 53.2	−23 22.7
	13	14 52.9	22.7
	14	29 52.6	22.6
	15	44 52.3	•• 22.5
	16	59 52.0	22.4
	17	74 51.7	22.3
	18	89 51.3	−23 22.2
	19	104 51.0	22.1
	20	119 50.7	22.1
	21	134 50.4	•• 22.0
	22	149 50.1	21.9
	23	164 49.8	21.8
	24	179 49.5	−23 21.7
code		—	0

STARS No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.2	−40 29.1
5	Achernar	335 59.0	−57 28.1
30	Acrux	173 58.5	−62 50.8
19	Adhara	255 46.6	−28 54.6
10	Aldebaran	291 39.4	+16 25.3
32	Alioth	166 59.1	+56 11.8
34	Alkaid	153 33.5	+49 31.9
55	Al Na'ir	28 38.9	−47 10.9
15	Alnilam	276 30.5	− 1 13.7
25	Alphard	218 38.9	− 8 27.8
41	Alphecca	126 48.4	+26 51.7
1	Alpheratz	358 28.9	+28 50.8
51	Altair	62 51.3	+ 8 44.9
2	Ankaa	353 58.8	−42 33.1
42	Antares	113 20.4	−26 20.0
37	Arcturus	146 35.8	+19 24.8
43	Atria	109 02.2	−68 56.8
22	Avior	234 35.5	−59 21.7
13	Bellatrix	279 18.7	+ 6 18.7
16	Betelg'se	271 48.4	+ 7 24.0
17	Canopus	264 15.0	−52 40.2
12	Capella	281 38.8	+45 57.4
53	Deneb	50 01.8	+45 07.3
28	Denebola	183 18.2	+14 49.2
4	Diphda	349 39.7	−18 14.0
27	Dubhe	194 45.0	+61 59.3
14	Elnath	279 07.6	+28 34.3
47	Eltanin	91 07.0	+51 29.6
54	Enif	34 30.3	+ 9 40.2
56	Fomalhaut	16 12.3	−29 51.7
31	Gacrux	172 50.0	−56 51.5
29	Gienah	176 37.4	−17 17.5
35	Hadar	149 50.6	−60 09.3
6	Hamal	328 50.1	+23 15.2
48	Kaus Aust.	84 42.3	−34 24.5
40	Kochab	137 18.6	+74 20.0
57	Markab	14 22.1	+14 57.9
8	Menkar	315 00.7	+ 3 55.0
36	Menkent	148 59.5	−36 08.9
24	Miapl'dus	221 48.5	−69 31.7
9	Mirfak	309 42.8	+49 42.4
50	Nunki	76 52.9	−26 21.3
52	Peacock	54 28.6	−56 53.0
21	Pollux	244 20.9	+28 08.1
20	Procyon	245 45.2	+ 5 20.4
46	R'alhague	96 47.5	+12 35.4
26	Regulus	208 29.9	+12 11.1
11	Rigel	281 53.8	− 8 15.1
38	Rigil Kent.	140 52.2	−60 39.0
44	Sabik	103 03.1	−15 40.3
3	Schedar	350 30.6	+56 17.8
45	Shaula	97 21.8	−37 04.4
18	Sirius	259 12.0	−16 39.2
33	Spica	159 17.6	−10 55.7
23	Suhail	223 24.4	−43 14.9
49	Vega	81 09.1	+38 44.5
39	Zub'g'bi	137 54.2	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 24	Moonrise 25	Moonrise 26	Moonrise 27
N °	h m	h m	h m	h m	h m	h m
72	■	6 55	■	■	■	13 25
70	■	6 46	■	■	■	12 01
68	■	6 39	■	■	11 57	11 22
66	10 36	6 33	■	11 18	11 03	10 55
64	9 53	6 27	9 53	10 19	10 30	10 33
62	9 25	6 22	9 11	9 45	10 05	10 16
60	9 03	6 17	8 42	9 21	9 46	10 02
58	8 46	6 13	8 20	9 01	9 30	9 50
56	8 31	6 09	8 02	8 45	9 16	9 39
54	8 19	6 04	7 47	8 31	9 04	9 30
52	8 07	6 01	7 34	8 18	8 54	9 22
50	7 58	5 57	7 22	8 07	8 44	9 14
45	7 37	5 49	6 59	7 45	8 24	8 58
40	7 20	5 41	6 39	7 27	8 08	8 45
35	7 06	5 34	6 23	7 11	7 55	8 33
30	6 53	5 27	6 09	6 58	7 43	8 23
20	6 32	5 13	5 46	6 35	7 22	8 06
10	6 14	4 58	5 25	6 15	7 04	7 51
0	5 56	4 41	5 06	5 57	6 48	7 37
10	5 39	4 20	4 47	5 39	6 31	7 23
20	5 20	3 55	4 27	5 19	6 13	7 08
30	4 57	3 20	4 03	4 56	5 52	6 50
35	4 44	2 57	3 49	4 43	5 40	6 40
40	4 29	2 26	3 33	4 27	5 26	6 28
45	4 11	1 38	3 14	4 09	5 10	6 15
50	3 49	////	2 50	3 46	4 49	5 58
52	3 38	////	2 39	3 35	4 39	5 50
54	3 26	////	2 26	3 22	4 28	5 41
56	3 11	////	2 11	3 08	4 16	5 31
58	2 55	////	1 53	2 51	4 01	5 19
60	2 34	////	1 31	2 30	3 44	5 06
S						

Lat.	Sunset	Twlt. ends	Moonset 24	Moonset 25	Moonset 26	Moonset 27
N °	h m	h m	h m	h m	h m	h m
72	■	17 03	■	■	■	14 31
70	■	17 12	■	■	■	15 52
68	■	17 19	■	■	14 13	16 30
66	13 25	17 27	■	13 07	15 07	16 56
64	14 07	17 33	12 45	14 05	15 39	17 17
62	14 35	17 38	13 27	14 38	16 03	17 33
60	14 57	17 43	13 56	15 03	16 22	17 46
58	15 14	17 47	14 18	15 22	16 37	17 58
56	15 29	17 51	14 36	15 38	16 50	18 08
54	15 41	17 55	14 51	15 52	17 02	18 17
52	15 52	17 58	15 04	16 04	17 12	18 25
50	16 02	18 02	15 15	16 15	17 21	18 32
45	16 23	18 10	15 39	16 37	17 40	18 47
40	16 39	18 17	15 58	16 55	17 56	18 59
35	16 54	18 25	16 14	17 10	18 09	19 09
30	17 06	18 32	16 28	17 23	18 20	19 18
20	17 28	18 47	16 52	17 45	18 39	19 34
10	17 46	19 01	17 12	18 04	18 56	19 48
0	18 04	19 19	17 31	18 22	19 12	20 00
10	18 21	19 39	17 50	18 39	19 27	20 13
20	18 40	20 04	18 10	18 58	19 43	20 26
30	19 02	20 39	18 33	19 20	20 02	20 41
35	19 15	21 02	18 47	19 32	20 13	20 50
40	19 30	21 33	19 02	19 47	20 26	21 00
45	19 48	22 21	19 21	20 04	20 40	21 11
50	20 11	////	19 45	20 25	20 58	21 25
52	20 22	////	19 56	20 35	21 07	21 32
54	20 34	////	20 08	20 47	21 16	21 39
56	20 48	////	20 23	21 00	21 27	21 47
58	21 05	////	20 40	21 14	21 39	21 56
60	21 25	////	21 01	21 32	21 53	22 06
S						

GMT	Equation of Time (App.—Mean) 24	25	26
h	m s	m s	m s
0	+ 0 48.3	+ 0 18.3	− 0 11.6
6	+ 0 40.8	+ 0 10.8	− 0 19.1
12	+ 0 33.3	+ 0 03.3	− 0 26.6
18	+ 0 25.8	− 0 04.1	− 0 34.0
24	+ 0 18.3	− 0 11.6	− 0 41.5

GMT of Transit
Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
24	11 18	9 08	16 54	1 52	8 54
25	12 09	9 06	16 52	1 47	8 50
26	13 00	9 05	16 51	1 43	8 47
27	13 49	9 03	16 50	1 38	8 43

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
	0.6	0.3	0.1
30			
	0.6	0.3	0.1
45			
	0.6	0.2	0.1
60			
	0.6	0.1	0.0
75			
	0.6	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	24	25	26
°	′	′	′
0			
	12.5	12.9	13.4
4			
	12.5	12.9	13.4
8			
	12.5	12.9	13.4
12			
	12.6	12.9	13.4
16			
	12.6	13.0	13.5
20			
	12.7	13.0	13.5
24			
	12.7	13.1	13.6
28			
	12.8	13.2	13.6
32			
	12.9	13.2	13.7
36			
	13.0	13.3	13.7
40			
	13.1	13.4	13.8
44			
	13.2	13.5	13.9
48			
	13.4	13.6	14.0
52			
	13.5	13.7	14.1
56			
	13.6	13.9	14.2
60			
	13.8	14.0	14.3
64			
	13.9	14.1	14.4
68			
	14.1	14.3	14.5
72			
	14.2	14.4	14.6
76			
	14.4	14.5	14.7
80			
	14.6	14.7	14.9
84			
	14.7	14.8	15.0
88			
	14.9	14.9	15.1
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	24	25	26
°	′	′	′
0			
	17.3	17.1	16.8
4			
	17.3	17.1	16.8
8			
	17.3	17.0	16.8
12			
	17.2	17.0	16.7
16			
	17.2	17.0	16.7
20			
	17.1	16.9	16.7
24			
	17.1	16.9	16.6
28			
	17.0	16.8	16.6
32			
	16.9	16.7	16.5
36			
	16.8	16.6	16.4
40			
	16.7	16.5	16.4
44			
	16.6	16.4	16.3
48			
	16.4	16.3	16.2
52			
	16.3	16.2	16.1
56			
	16.2	16.1	16.0
60			
	16.0	16.0	15.9
64			
	15.9	15.8	15.8
68			
	15.7	15.7	15.7
72			
	15.6	15.6	15.6
76			
	15.4	15.4	15.4
80			
	15.2	15.3	15.3
84			
	15.1	15.1	15.2
88			
	14.9	15.0	15.1
90			

Subtract from table, back cover

Christmas Day 25
New Moon 25

GMT	♈ GHA	VENUS −4.3 GHA	Dec.	MARS 0.8 GHA	Dec.	JUPITER −2.2 GHA	Dec.	SATURN 0.8 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
27 0	94 56.6	224 02.5	−14 45.6	107 20.8	− 6 06.0	335 20.9	+21 01.9	228 53.6	−15 03.8	159 38.1	114	−19 43.5	+ 81
1	109 59.1	239 03.3	45.9	122 21.6	05.2	350 23.7	02.0	243 55.8	03.8	174 08.5	114	19 35.4	+ 81
2	125 01.6	254 04.1	46.2	137 22.4	04.5	5 26.4	02.1	258 58.0	03.9	188 38.9	114	19 27.3	+ 83
3	140 04.0	269 04.9	·· 46.5	152 23.3	·· 03.7	20 29.2	·· 02.1	274 00.2	·· 04.0	203 09.3	115	·19 19.0	+ 83
4	155 06.5	284 05.6	46.7	167 24.1	03.0	35 32.0	02.2	289 02.5	04.0	217 39.8	115	19 10.7	+ 85
5	170 08.9	299 06.4	47.0	182 24.9	02.3	50 34.7	02.3	304 04.7	04.1	232 10.3	115	19 02.2	+ 85
6	185 11.4	314 07.2	−14 47.3	197 25.7	− 6 01.5	65 37.5	+21 02.3	319 06.9	−15 04.1	246 40.8	115	−18 53.7	+ 87
7	200 13.9	329 08.0	47.6	212 26.5	00.8	80 40.3	02.4	334 09.1	04.2	261 11.3	116	18 45.0	+ 87
8	215 16.3	344 08.8	47.9	227 27.4	6 00.0	95 43.0	02.5	349 11.4	04.3	275 41.9	117	18 36.3	+ 88
9	230 18.8	359 09.6	·· 48.2	242 28.2	· 5 59.3	110 45.8	·· 02.5	4 13.6	·· 04.3	290 12.6	117	·18 27.5	+ 89
10	245 21.3	14 10.4	48.5	257 29.0	58.5	125 48.6	02.6	19 15.8	04.4	304 43.3	117	18 18.6	+ 91
11	260 23.7	29 11.1	48.7	272 29.8	57.8	140 51.3	02.6	34 18.1	04.4	319 14.0	117	18 09.5	+ 91
12	275 26.2	44 11.9	−14 49.0	287 30.6	− 5 57.0	155 54.1	+21 02.7	49 20.3	−15 04.5	333 44.7	118	−18 00.4	+ 92
13	290 28.7	59 12.7	49.3	302 31.5	56.3	170 56.9	02.8	64 22.5	04.6	348 15.5	118	17 51.2	+ 93
14	305 31.1	74 13.5	49.6	317 32.3	55.5	185 59.7	02.8	79 24.7	04.6	2 46.3	119	17 41.9	+ 93
15	320 33.6	89 14.2	·· 49.9	332 33.1	·· 54.8	201 02.4	·· 02.9	94 27.0	·· 04.7	17 17.2	118	·17 32.6	+ 95
16	335 36.1	104 15.0	50.2	347 33.9	54.0	216 05.2	03.0	109 29.2	04.7	31 48.0	120	17 23.1	+ 96
17	350 38.5	119 15.7	50.5	2 34.8	53.3	231 08.0	03.0	124 31.4	04.8	46 19.0	119	17 13.5	+ 96
18	5 41.0	134 16.5	−14 50.8	17 35.6	− 5 52.5	246 10.7	+21 03.1	139 33.7	−15 04.9	60 49.9	120	−17 03.9	+ 98
19	20 43.4	149 17.3	51.1	32 36.4	51.8	261 13.5	03.2	154 35.9	04.9	75 20.9	120	16 54.1	+ 98
20	35 45.9	164 18.0	51.4	47 37.2	51.0	276 16.3	03.2	169 38.1	05.0	89 51.9	121	16 44.3	+ 99
21	50 48.4	179 18.8	·· 51.7	62 38.0	·· 50.3	291 19.0	·· 03.3	184 40.4	·· 05.0	104 23.0	121	·16 34.4	+100
22	65 50.8	194 19.5	52.0	77 38.9	49.5	306 21.8	03.4	199 42.6	05.1	118 54.1	121	16 24.4	+100
23	80 53.3	209 20.3	52.3	92 39.7	48.8	321 24.6	03.4	214 44.8	05.2	133 25.2	122	16 14.4	+102
28 0	95 55.8	224 21.0	−14 52.6	107 40.5	− 5 48.0	336 27.4	+21 03.5	229 47.0	−15 05.2	147 56.4	122	−16 04.2	+102
1	110 58.2	239 21.8	52.9	122 41.3	47.3	351 30.1	03.5	244 49.3	05.3	162 27.6	122	15 54.0	+104
2	126 00.7	254 22.5	53.2	137 42.2	46.5	6 32.9	03.6	259 51.5	05.3	176 58.8	123	15 43.6	+104
3	141 03.2	269 23.3	·· 53.5	152 43.0	·· 45.8	21 35.7	·· 03.7	274 53.7	·· 05.4	191 30.1	123	·15 33.2	+104
4	156 05.6	284 24.0	53.8	167 43.8	45.0	36 38.4	03.7	289 56.0	05.5	206 01.4	123	15 22.8	+106
5	171 08.1	299 24.8	54.1	182 44.6	44.3	51 41.2	03.8	304 58.2	05.5	220 32.7	123	15 12.2	+106
6	186 10.6	314 25.5	−14 54.4	197 45.5	− 5 43.5	66 44.0	+21 03.9	320 00.4	−15 05.6	235 04.0	124	−15 01.6	+108
7	201 13.0	329 26.2	54.7	212 46.3	42.8	81 46.8	03.9	335 02.7	05.6	249 35.4	125	14 50.8	+107
8	216 15.5	344 27.0	55.0	227 47.1	42.0	96 49.5	04.0	350 04.9	05.7	264 06.9	124	14 40.1	+109
9	231 17.9	359 27.7	·· 55.3	242 47.9	·· 41.3	111 52.3	·· 04.1	5 07.1	·· 05.7	278 38.3	125	·14 29.2	+109
10	246 20.4	14 28.4	55.6	257 48.7	40.5	126 55.1	04.1	20 09.4	05.8	293 09.8	125	14 18.3	+111
11	261 22.9	29 29.2	55.9	272 49.6	39.8	141 57.8	04.2	35 11.6	05.9	307 41.3	126	14 07.2	+111
12	276 25.3	44 29.9	−14 56.2	287 50.4	− 5 39.0	157 00.6	+21 04.3	50 13.8	−15 05.9	322 12.9	126	−13 56.1	+111
13	291 27.8	59 30.6	56.5	302 51.2	38.3	172 03.4	04.3	65 16.1	06.0	336 44.5	126	13 45.0	+112
14	306 30.3	74 31.3	56.8	317 52.0	37.5	187 06.2	04.4	80 18.3	06.0	351 16.1	126	13 33.8	+113
15	321 32.7	89 32.1	·· 57.1	332 52.9	·· 36.8	202 08.9	·· 04.4	95 20.5	·· 06.1	5 47.7	127	·13 22.5	+114
16	336 35.2	104 32.8	57.5	347 53.7	36.0	217 11.7	04.5	110 22.7	06.2	20 19.4	127	13 11.1	+115
17	351 37.7	119 33.5	57.8	2 54.5	35.3	232 14.5	04.6	125 25.0	06.2	34 51.1	127	12 59.6	+115
18	6 40.1	134 34.2	−14 58.1	17 55.3	− 5 34.5	247 17.3	+21 04.6	140 27.2	−15 06.3	49 22.8	127	−12 48.1	+115
19	21 42.6	149 34.9	58.4	32 56.2	33.8	262 20.0	04.7	155 29.4	06.3	63 54.5	128	12 36.6	+117
20	36 45.1	164 35.6	58.7	47 57.0	33.0	277 22.8	04.8	170 31.7	06.4	78 26.3	128	12 24.9	+117
21	51 47.5	179 36.3	·· 59.0	62 57.8	·· 32.3	292 25.6	·· 04.8	185 33.9	·· 06.5	92 58.1	128	·12 13.2	+117
22	66 50.0	194 37.1	59.3	77 58.6	31.5	307 28.4	04.9	200 36.1	06.5	107 29.9	129	12 01.5	+119
23	81 52.4	209 37.8	14 59.6	92 59.4	30.8	322 31.1	05.0	215 38.4	06.6	122 01.8	128	11 49.6	+119
29 0	96 54.9	224 38.5	−15 00.0	108 00.3	− 5 30.0	337 33.9	+21 05.0	230 40.6	−15 06.6	136 33.6	129	−11 37.7	+119
1	111 57.4	239 39.2	00.3	123 01.1	29.3	352 36.7	05.1	245 42.8	06.7	151 05.5	129	11 25.8	+121
2	126 59.8	254 39.9	00.6	138 01.9	28.5	7 39.5	05.2	260 45.1	06.7	165 37.4	130	11 13.7	+120
3	142 02.3	269 40.6	·· 00.9	153 02.7	·· 27.8	22 42.2	·· 05.2	275 47.3	·· 06.8	180 09.4	129	·11 01.7	+122
4	157 04.8	284 41.2	01.2	168 03.6	27.0	37 45.0	05.3	290 49.5	06.9	194 41.3	130	10 49.5	+122
5	172 07.2	299 41.9	01.6	183 04.4	26.3	52 47.8	05.4	305 51.8	06.9	209 13.3	130	10 37.3	+122
6	187 09.7	314 42.6	−15 01.9	198 05.2	− 5 25.5	67 50.6	+21 05.4	320 54.0	−15 07.0	223 45.3	130	−10 25.1	+123
7	202 12.2	329 43.3	02.2	213 06.0	24.8	82 53.4	05.5	335 56.2	07.0	238 17.3	131	10 12.8	+124
8	217 14.6	344 44.0	02.5	228 06.9	24.0	97 56.1	05.5	350 58.5	07.1	252 49.4	130	10 00.4	+124
9	232 17.1	359 44.7	·· 02.8	243 07.7	·· 23.3	112 58.9	·· 05.6	6 00.7	·· 07.1	267 21.4	131	· 9 48.0	+125
10	247 19.5	14 45.4	03.2	258 08.5	22.5	128 01.7	05.7	21 02.9	07.2	281 53.5	131	9 35.5	+125
11	262 22.0	29 46.1	03.5	273 09.3	21.8	143 04.5	05.7	36 05.2	07.3	296 25.6	131	9 23.0	+126
12	277 24.5	44 46.7	−15 03.8	288 10.2	− 5 21.0	158 07.2	+21 05.8	51 07.4	−15 07.3	310 57.7	131	− 9 10.4	+126
13	292 26.9	59 47.4	04.1	303 11.0	20.3	173 10.0	05.9	66 09.6	07.4	325 29.8	132	8 57.8	+127
14	307 29.4	74 48.1	04.5	318 11.8	19.5	188 12.8	05.9	81 11.9	07.4	340 02.0	131	8 45.1	+127
15	322 31.9	89 48.8	·· 04.8	333 12.6	·· 18.8	203 15.6	·· 06.0	96 14.1	·· 07.5	354 34.1	132	· 8 32.4	+128
16	337 34.3	104 49.4	05.1	348 13.5	18.0	218 18.4	06.1	111 16.3	07.6	9 06.3	131	8 19.6	+128
17	352 36.8	119 50.1	05.4	3 14.3	17.3	233 21.1	06.1	126 18.6	07.6	23 38.4	132	8 06.8	+129
18	7 39.3	134 50.8	−15 05.8	18 15.1	− 5 16.5	248 23.9	+21 06.2	141 20.8	−15 07.7	38 10.6	132	− 7 53.9	+129
19	22 41.7	149 51.4	06.1	33 15.9	15.8	263 26.7	06.3	156 23.0	07.7	52 42.8	132	7 41.0	+130
20	37 44.2	164 52.1	06.4	48 16.8	15.0	278 29.5	06.3	171 25.3	07.8	67 15.0	132	7 28.0	+130
21	52 46.7	179 52.8	·· 06.8	63 17.6	·· 14.3	293 32.3	·· 06.4	186 27.5	·· 07.8	81 47.2	132	· 7 15.0	+130
22	67 49.1	194 53.4	07.1	78 18.4	13.5	308 35.0	06.5	201 29.8	07.9	96 19.4	133	7 02.0	+131
23	82 51.6	209 54.1	07.4	93 19.2	12.8	323 37.8	06.5	216 32.0	08.0	110 51.7	132	6 48.9	+131
24	97 54.0	224 54.8	−15 07.7	108 20.1	− 5 12.0	338 40.6	+21 06.6	231 34.2	−15 08.0	125 23.9	132	− 6 35.8	+132
code	—	+ 7	− 3	+ 8	+ 7	+ 28	0	+ 23	− 1				

GMT		SUN GHA	SUN Dec.
	h	° ′	° ′
27	0	179 49.5	−23 21.7
	1	194 49.2	21.6
	2	209 48.9	21.5
	3	224 48.5 ••	21.4
	4	239 48.2	21.3
	5	254 47.9	21.2
	6	269 47.6	−23 21.1
	7	284 47.3	21.1
	8	299 47.0	21.0
	9	314 46.7 ••	20.9
	10	329 46.4	20.8
	11	344 46.1	20.7
	12	359 45.8	−23 20.6
	13	14 45.5	20.5
	14	29 45.1	20.4
	15	44 44.8 ••	20.3
	16	59 44.5	20.2
	17	74 44.2	20.0
	18	89 43.9	−23 19.9
	19	104 43.6	19.8
	20	119 43.3	19.7
	21	134 43.0 ••	19.6
	22	149 42.7	19.5
	23	164 42.4	19.4
28	0	179 42.1	−23 19.3
	1	194 41.7	19.2
	2	209 41.4	19.1
	3	224 41.1 ••	19.0
	4	239 40.8	18.9
	5	254 40.5	18.7
	6	269 40.2	−23 18.6
	7	284 39.9	18.5
	8	299 39.6	18.4
	9	314 39.3 ••	18.3
	10	329 39.0	18.2
	11	344 38.7	18.0
	12	359 38.4	−23 17.9
	13	14 38.0	17.8
	14	29 37.7	17.7
	15	44 37.4 ••	17.6
	16	59 37.1	17.4
	17	74 36.8	17.3
	18	89 36.5	−23 17.2
	19	104 36.2	17.1
	20	119 35.9	16.9
	21	134 35.6 ••	16.8
	22	149 35.3	16.7
	23	164 35.0	16.6
29	0	179 34.7	−23 16.4
	1	194 34.4	16.3
	2	209 34.1	16.2
	3	224 33.7 ••	16.0
	4	239 33.4	15.9
	5	254 33.1	15.8
	6	269 32.8	−23 15.6
	7	284 32.5	15.5
	8	299 32.2	15.4
	9	314 31.9 ••	15.2
	10	329 31.6	15.1
	11	344 31.3	14.9
	12	359 31.0	−23 14.8
	13	14 30.7	14.7
	14	29 30.4	14.5
	15	44 30.1 ••	14.4
	16	59 29.8	14.2
	17	74 29.5	14.1
	18	89 29.2	−23 14.0
	19	104 28.9	13.8
	20	119 28.6	13.7
	21	134 28.2 ••	13.5
	22	149 27.9	13.4
	23	164 27.6	13.2
	24	179 27.3	−23 13.1
code		—	+ 1

STARS No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.2	−40 29.1
5	Achernar	335 59.0	−57 28.1
30	Acrux	173 58.5	−62 50.8
19	Adhara	255 46.6	−28 54.6
10	Aldebaran	291 39.4	+16 25.3
32	Alioth	166 59.0	+56 11.8
34	Alkaid	153 33.5	+49 31.9
55	Al Na'ir	28 38.9	−47 10.9
15	Alnilam	276 30.5	− 1 13.7
25	Alphard	218 38.9	− 8 27.8
41	Alphecca	126 48.4	+26 51.7
1	Alpheratz	358 28.9	+28 50.8
51	Altair	62 51.3	+ 8 44.9
2	Ankaa	353 58.8	−42 33.1
42	Antares	113 20.4	−26 20.0
37	Arcturus	146 35.8	+19 24.7
43	Atria	109 02.1	−68 56.8
22	Avior	234 35.5	−59 21.8
13	Bellatrix	279 18.7	+ 6 18.7
16	Betelg'se	271 48.4	+ 7 24.0
17	Canopus	264 15.0	−52 40.2
12	Capella	281 38.8	+45 57.4
53	Deneb	50 01.8	+45 07.3
28	Denebola	183 18.2	+14 49.2
4	Diphda	349 39.7	−18 14.0
27	Dubhe	194 44.9	+61 59.3
14	Elnath	279 07.6	+28 34.3
47	Eltanin	91 07.0	+51 29.6
54	Enif	34 30.4	+ 9 40.2
56	Fomalhaut	16 12.3	−29 51.7
31	Gacrux	172 49.9	−56 51.5
29	Gienah	176 37.4	−17 17.6
35	Hadar	149 50.5	−60 09.3
6	Hamal	328 50.1	+23 15.2
48	Kaus Aust.	84 42.3	−34 24.5
40	Kochab	137 18.6	+74 20.0
57	Markab	14 22.1	+14 57.9
8	Menkar	315 00.7	+ 3 55.0
36	Menkent	148 59.5	−36 08.9
24	Miapl'dus	221 48.5	−69 31.8
9	Mirfak	309 42.8	+49 42.4
50	Nunki	76 52.9	−26 21.3
52	Peacock	54 28.6	−56 53.0
21	Pollux	244 20.9	+28 08.1
20	Procyon	245 45.2	+ 5 20.4
46	R'alhague	96 47.5	+12 35.4
26	Regulus	208 29.9	+12 11.1
11	Rigel	281 53.8	− 8 15.1
38	Rigil Kent.	140 52.1	−60 38.9
44	Sabik	103 03.1	−15 40.3
3	Schedar	350 30.6	+56 17.8
45	Shaula	97 21.8	−37 04.4
18	Sirius	259 12.0	−16 39.2
33	Spica	159 17.6	−10 55.7
23	Suhail	223 24.4	−43 14.9
49	Vega	81 09.1	+38 44.5
39	Zub'g'bi	137 54.2	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 27	Moonrise 28	Moonrise 29	Moonrise 30
N °	h m	h m	h m	h m	h m	h m
72	■	6 56	13 25	11 53	11 18	10 52
70	■	6 46	12 01	11 26	11 04	10 46
68	■	6 39	11 22	11 05	10 52	10 42
66	10 34	6 34	10 55	10 49	10 43	10 38
64	9 53	6 28	10 33	10 35	10 35	10 34
62	9 25	6 23	10 16	10 23	10 28	10 31
60	9 04	6 18	10 02	10 13	10 22	10 29
58	8 46	6 13	9 50	10 05	10 16	10 26
56	8 32	6 10	9 39	9 57	10 12	10 24
54	8 19	6 06	9 30	9 50	10 07	10 22
52	8 08	6 02	9 22	9 44	10 03	10 20
50	7 58	5 59	9 14	9 39	10 00	10 19
45	7 38	5 51	8 58	9 27	9 52	10 15
40	7 21	5 42	8 45	9 17	9 45	10 13
35	7 07	5 36	8 33	9 08	9 40	10 10
30	6 55	5 29	8 23	9 00	9 35	10 08
20	6 33	5 14	8 06	8 47	9 26	10 04
10	6 15	5 00	7 51	8 36	9 19	10 01
0	5 58	4 42	7 37	8 25	9 11	9 57
10	5 40	4 21	7 23	8 14	9 04	9 54
20	5 21	3 57	7 08	8 02	8 57	9 51
30	4 59	3 23	6 50	7 49	8 48	9 47
35	4 46	2 59	6 40	7 41	8 43	9 45
40	4 31	2 28	6 28	7 32	8 37	9 42
45	4 13	1 40	6 15	7 22	8 30	9 39
50	3 51	////	5 58	7 09	8 22	9 36
52	3 40	////	5 50	7 03	8 18	9 34
54	3 28	////	5 41	6 57	8 14	9 32
56	3 14	////	5 31	6 50	8 10	9 30
58	2 57	////	5 19	6 41	8 04	9 28
60	2 37	////	5 06	6 32	7 59	9 26
S						

Lat.	Sunset	Twlt. ends	Moonset 27	Moonset 28	Moonset 29	Moonset 30
N °	h m	h m	h m	h m	h m	h m
72	■	17 06	14 31	17 41	19 53	21 57
70	■	17 15	15 52	18 07	20 05	22 00
68	■	17 23	16 30	18 26	20 15	22 02
66	13 29	17 29	16 56	18 41	20 23	22 03
64	14 10	17 35	17 17	18 54	20 29	22 05
62	14 38	17 40	17 33	19 04	20 35	22 06
60	14 59	17 45	17 46	19 13	20 40	22 07
58	15 17	17 49	17 58	19 21	20 44	22 08
56	15 31	17 53	18 08	19 27	20 48	22 09
54	15 44	17 57	18 17	19 33	20 51	22 10
52	15 55	18 01	18 25	19 39	20 54	22 10
50	16 05	18 04	18 32	19 44	20 57	22 11
45	16 25	18 12	18 47	19 54	21 03	22 12
40	16 41	18 19	18 59	20 03	21 08	22 14
35	16 56	18 27	19 09	20 11	21 12	22 15
30	17 08	18 33	19 18	20 17	21 16	22 15
20	17 29	18 48	19 34	20 28	21 23	22 17
10	17 48	19 03	19 48	20 38	21 28	22 18
0	18 05	19 20	20 00	20 47	21 33	22 19
10	18 22	19 40	20 13	20 56	21 39	22 20
20	18 41	20 05	20 26	21 06	21 44	22 22
30	19 03	20 39	20 41	21 17	21 50	22 23
35	19 16	21 03	20 50	21 23	21 54	22 24
40	19 31	21 34	21 00	21 30	21 58	22 25
45	19 49	22 21	21 11	21 38	22 03	22 25
50	20 11	////	21 25	21 48	22 08	22 26
52	20 22	////	21 32	21 52	22 10	22 27
54	20 34	////	21 39	21 57	22 13	22 28
56	20 49	////	21 47	22 03	22 16	22 28
58	21 05	////	21 56	22 09	22 19	22 29
60	21 25	////	22 06	22 16	22 23	22 30
S						

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.6	0.3	0.1
30	0.6	0.3	0.1
45	0.6	0.2	0.1
60	0.6	0.1	0.0
75	0.6	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	27	28	29
°	′	′	′
0	13.9	14.5	15.2
4	13.9	14.5	15.2
8	13.9	14.5	15.2
12	13.9	14.6	15.2
16	14.0	14.6	15.2
20	14.0	14.6	15.2
24	14.0	14.6	15.2
28	14.1	14.6	15.2
32	14.1	14.7	15.2
36	14.2	14.7	15.2
40	14.2	14.7	15.2
44	14.3	14.8	15.3
48	14.4	14.8	15.3
52	14.4	14.9	15.3
56	14.5	14.9	15.3
60	14.6	15.0	15.3
64	14.7	15.0	15.3
68	14.8	15.1	15.4
72	14.8	15.1	15.4
76	14.9	15.2	15.4
80	15.0	15.2	15.4
84	15.1	15.3	15.4
88	15.2	15.3	15.5
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	27	28	29
°	′	′	′
0	16.5	16.1	15.8
4	16.5	16.1	15.8
8	16.5	16.1	15.8
12	16.5	16.1	15.8
16	16.4	16.1	15.8
20	16.4	16.1	15.7
24	16.4	16.1	15.7
28	16.3	16.0	15.7
32	16.3	16.0	15.7
36	16.2	16.0	15.7
40	16.2	15.9	15.7
44	16.1	15.9	15.7
48	16.0	15.8	15.7
52	16.0	15.8	15.6
56	15.9	15.8	15.6
60	15.8	15.7	15.6
64	15.7	15.7	15.6
68	15.6	15.6	15.6
72	15.6	15.6	15.6
76	15.5	15.5	15.5
80	15.4	15.4	15.5
84	15.3	15.4	15.5
88	15.2	15.3	15.5
90			

Subtract from table, back cover

Equation of Time (App.—Mean)

GMT	27	28	29
h	m s	m s	m s
0	− 0 41.5	− 1 11.2	− 1 40.7
6	− 0 48.9	− 1 18.6	− 1 48.1
12	− 0 56.3	− 1 26.0	− 1 55.4
18	− 1 03.8	− 1 33.3	− 2 02.7
24	− 1 11.2	− 1 40.7	− 2 10.0

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
27	13 49	9 03	16 50	1 38	8 43
28	14 36	9 02	16 48	1 34	8 40
29	15 22	9 01	16 47	1 30	8 36
30	16 08	9 00	16 46	1 25	8 33

GMT	♈ GHA	VENUS −4.3 GHA	Dec.	MARS 0.8 GHA	Dec.	JUPITER −2.2 GHA	Dec.	SATURN 0.8 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
30 0	97 54.0	224 54.8	−15 07.7	108 20.1	− 5 12.0	338 40.6	+21 06.6	231 34.2	−15 08.0	125 23.9	132	− 6 35.8	+132
1	112 56.5	239 55.4	08.1	123 20.9	11.2	353 43.4	06.7	246 36.5	08.1	139 56.1	133	6 22.6	+132
2	127 59.0	254 56.1	08.4	138 21.7	10.5	8 46.2	06.7	261 38.7	08.1	154 28.4	132	6 09.4	+132
3	143 01.4	269 56.7	·· 08.7	153 22.5	·· 09.7	23 48.9	·· 06.8	276 40.9	·· 08.2	169 00.6	132	· 5 56.2	+133
4	158 03.9	284 57.4	09.1	168 23.3	09.0	38 51.7	06.8	291 43.2	08.2	183 32.8	133	5 42.9	+133
5	173 06.4	299 58.0	09.4	183 24.2	08.2	53 54.5	06.9	306 45.4	08.3	198 05.1	132	5 29.6	+134
6	188 08.8	314 58.7	−15 09.7	198 25.0	− 5 07.5	68 57.3	+21 07.0	321 47.6	−15 08.4	212 37.3	133	− 5 16.2	+134
7	203 11.3	329 59.3	10.1	213 25.8	06.7	84 00.1	07.0	336 49.9	08.4	227 09.6	132	5 02.8	+134
8	218 13.8	344 59.9	10.4	228 26.6	06.0	99 02.8	07.1	351 52.1	08.5	241 41.8	133	4 49.4	+134
9	233 16.2	0 00.6	·· 10.8	243 27.5	·· 05.2	114 05.6	·· 07.2	6 54.3	·· 08.5	256 14.1	132	· 4 36.0	+135
10	248 18.7	15 01.2	11.1	258 28.3	04.5	129 08.4	07.2	21 56.6	08.6	270 46.3	132	4 22.5	+134
11	263 21.2	30 01.9	11.4	273 29.1	03.7	144 11.2	07.3	36 58.8	08.6	285 18.5	133	4 09.0	+136
12	278 23.6	45 02.5	−15 11.8	288 30.0	− 5 03.0	159 14.0	+21 07.4	52 01.1	−15 08.7	299 50.8	132	− 3 55.4	+135
13	293 26.1	60 03.1	12.1	303 30.8	02.2	174 16.8	07.4	67 03.3	08.8	314 23.0	132	3 41.9	+136
14	308 28.5	75 03.8	12.5	318 31.6	01.5	189 19.5	07.5	82 05.5	08.8	328 55.2	132	3 28.3	+137
15	323 31.0	90 04.4	·· 12.8	333 32.4	·· 00.7	204 22.3	·· 07.6	97 07.8	·· 08.9	343 27.4	132	· 3 14.6	+136
16	338 33.5	105 05.0	13.1	348 33.3	5 00.0	219 25.1	07.6	112 10.0	08.9	357 59.6	132	3 01.0	+137
17	353 35.9	120 05.6	13.5	3 34.1	4 59.2	234 27.9	07.7	127 12.2	09.0	12 31.8	132	2 47.3	+137
18	8 38.4	135 06.3	−15 13.8	18 34.9	− 4 58.5	249 30.7	+21 07.8	142 14.5	−15 09.0	27 04.0	131	− 2 33.6	+137
19	23 40.9	150 06.9	14.2	33 35.7	57.7	264 33.5	07.8	157 16.7	09.1	41 36.1	132	2 19.9	+137
20	38 43.3	165 07.5	14.5	48 36.6	57.0	279 36.2	07.9	172 19.0	09.1	56 08.3	131	2 06.2	+138
21	53 45.8	180 08.1	·· 14.8	63 37.4	·· 56.2	294 39.0	·· 08.0	187 21.2	·· 09.2	70 40.4	131	· 1 52.4	+138
22	68 48.3	195 08.7	15.2	78 38.2	55.5	309 41.8	08.0	202 23.4	09.3	85 12.5	131	1 38.6	+138
23	83 50.7	210 09.3	15.5	93 39.0	54.7	324 44.6	08.1	217 25.7	09.3	99 44.6	131	1 24.8	+138
31 0	98 53.2	225 10.0	−15 15.9	108 39.9	− 4 53.9	339 47.4	+21 08.2	232 27.9	−15 09.4	114 16.7	131	− 1 11.0	+138
1	113 55.6	240 10.6	16.2	123 40.7	53.2	354 50.2	08.2	247 30.1	09.4	128 48.8	130	0 57.2	+139
2	128 58.1	255 11.2	16.6	138 41.5	52.4	9 52.9	08.3	262 32.4	09.5	143 20.8	131	0 43.3	+139
3	144 00.6	270 11.8	·· 16.9	153 42.3	·· 51.7	24 55.7	·· 08.4	277 34.6	·· 09.5	157 52.9	130	· 0 29.4	+138
4	159 03.0	285 12.4	17.3	168 43.2	50.9	39 58.5	08.4	292 36.9	09.6	172 24.9	129	0 15.6	+139
5	174 05.5	300 13.0	17.6	183 44.0	50.2	55 01.3	08.5	307 39.1	09.7	186 56.8	130	− 0 01.7	+139
6	189 08.0	315 13.6	−15 18.0	198 44.8	− 4 49.4	70 04.1	+21 08.6	322 41.3	−15 09.7	201 28.8	129	+ 0 12.2	+139
7	204 10.4	330 14.2	18.3	213 45.6	48.7	85 06.9	08.6	337 43.6	09.8	216 00.7	129	0 26.1	+139
8	219 12.9	345 14.8	18.7	228 46.5	47.9	100 09.7	08.7	352 45.8	09.8	230 32.6	129	0 40.0	+140
9	234 15.4	0 15.4	·· 19.0	243 47.3	·· 47.2	115 12.4	·· 08.8	7 48.1	·· 09.9	245 04.5	129	· 0 54.0	+139
10	249 17.8	15 16.0	19.4	258 48.1	46.4	130 15.2	08.8	22 50.3	09.9	259 36.4	128	1 07.9	+139
11	264 20.3	30 16.6	19.7	273 48.9	45.7	145 18.0	08.9	37 52.5	10.0	274 08.2	128	1 21.8	+140
12	279 22.8	45 17.2	−15 20.1	288 49.8	− 4 44.9	160 20.8	+21 08.9	52 54.8	−15 10.0	288 40.0	127	+ 1 35.8	+139
13	294 25.2	60 17.7	20.4	303 50.6	44.2	175 23.6	09.0	67 57.0	10.1	303 11.7	128	1 49.7	+140
14	309 27.7	75 18.3	20.8	318 51.4	43.4	190 26.4	09.1	82 59.2	10.2	317 43.5	127	2 03.7	+139
15	324 30.1	90 18.9	·· 21.1	333 52.3	·· 42.6	205 29.2	·· 09.1	98 01.5	·· 10.2	332 15.2	126	· 2 17.6	+140
16	339 32.6	105 19.5	21.5	348 53.1	41.9	220 32.0	09.2	113 03.7	10.3	346 46.8	126	2 31.6	+139
17	354 35.1	120 20.1	21.8	3 53.9	41.1	235 34.7	09.3	128 06.0	10.3	1 18.4	126	2 45.5	+140
18	9 37.5	135 20.7	−15 22.2	18 54.7	− 4 40.4	250 37.5	+21 09.3	143 08.2	−15 10.4	15 50.0	126	+ 2 59.5	+139
19	24 40.0	150 21.2	22.6	33 55.6	39.6	265 40.3	09.4	158 10.4	10.4	30 21.6	125	3 13.4	+140
20	39 42.5	165 21.8	22.9	48 56.4	38.9	280 43.1	09.5	173 12.7	10.5	44 53.1	124	3 27.4	+139
21	54 44.9	180 22.4	·· 23.3	63 57.2	·· 38.1	295 45.9	·· 09.5	188 14.9	·· 10.5	59 24.5	124	· 3 41.3	+139
22	69 47.4	195 23.0	23.6	78 58.0	37.4	310 48.7	09.6	203 17.2	10.6	73 55.9	124	3 55.2	+140
23	84 49.9	210 23.5	24.0	93 58.9	36.6	325 51.5	09.7	218 19.4	10.7	88 27.3	124	4 09.2	+139
1 0	99 52.3	225 24.1	−15 24.3	108 59.7	− 4 35.9	340 54.3	+21 09.7	233 21.6	−15 10.7	102 58.7	122	+ 4 23.1	+139
1	114 54.8	240 24.7	24.7	124 00.5	35.1	355 57.0	09.8	248 23.9	10.8	117 29.9	123	4 37.0	+139
2	129 57.3	255 25.2	25.1	139 01.3	34.4	10 59.8	09.9	263 26.1	10.8	132 01.2	122	4 50.9	+139
3	144 59.7	270 25.8	·· 25.4	154 02.2	·· 33.6	26 02.6	·· 09.9	278 28.4	·· 10.9	146 32.4	121	· 5 04.8	+138
4	160 02.2	285 26.4	25.8	169 03.0	32.9	41 05.4	10.0	293 30.6	10.9	161 03.5	121	5 18.6	+139
5	175 04.6	300 26.9	26.1	184 03.8	32.1	56 08.2	10.1	308 32.8	11.0	175 34.6	121	5 32.5	+138
6	190 07.1	315 27.5	−15 26.5	199 04.7	− 4 31.3	71 11.0	+21 10.1	323 35.1	−15 11.0	190 05.7	120	+ 5 46.3	+138
7	205 09.6	330 28.0	26.9	214 05.5	30.6	86 13.8	10.2	338 37.3	11.1	204 36.7	119	6 00.1	+138
8	220 12.0	345 28.6	27.2	229 06.3	29.8	101 16.6	10.3	353 39.6	11.2	219 07.6	119	6 13.9	+138
9	235 14.5	0 29.1	·· 27.6	244 07.1	·· 29.1	116 19.4	·· 10.3	8 41.8	·· 11.2	233 38.5	118	· 6 27.7	+138
10	250 17.0	15 29.7	28.0	259 08.0	28.3	131 22.1	10.4	23 44.1	11.3	248 09.3	118	6 41.5	+137
11	265 19.4	30 30.2	28.3	274 08.8	27.6	146 24.9	10.5	38 46.3	11.3	262 40.1	117	6 55.2	+137
12	280 21.9	45 30.8	−15 28.7	289 09.6	− 4 26.8	161 27.7	+21 10.5	53 48.5	−15 11.4	277 10.8	117	+ 7 08.9	+137
13	295 24.4	60 31.3	29.1	304 10.4	26.1	176 30.5	10.6	68 50.8	11.4	291 41.5	116	7 22.6	+137
14	310 26.8	75 31.9	29.4	319 11.3	25.3	191 33.3	10.7	83 53.0	11.5	306 12.1	115	7 36.3	+136
15	325 29.3	90 32.4	·· 29.8	334 12.1	·· 24.6	206 36.1	·· 10.7	98 55.3	·· 11.5	320 42.6	115	· 7 49.9	+136
16	340 31.7	105 33.0	30.2	349 12.9	23.8	221 38.9	10.8	113 57.5	11.6	335 13.1	114	8 03.5	+136
17	355 34.2	120 33.5	30.5	4 13.8	23.0	236 41.7	10.9	128 59.8	11.7	349 43.5	113	8 17.1	+135
18	10 36.7	135 34.0	−15 30.9	19 14.6	− 4 22.3	251 44.5	+21 10.9	144 02.0	−15 11.7	4 13.8	113	+ 8 30.6	+136
19	25 39.1	150 34.6	31.3	34 15.4	21.5	266 47.3	11.0	159 04.2	11.8	18 44.1	112	8 44.2	+134
20	40 41.6	165 35.1	31.6	49 16.2	20.8	281 50.1	11.1	174 06.5	11.8	33 14.3	112	8 57.6	+135
21	55 44.1	180 35.6	·· 32.0	64 17.1	·· 20.0	296 52.8	·· 11.1	189 08.7	·· 11.9	47 44.5	111	· 9 11.1	+134
22	70 46.5	195 36.2	32.4	79 17.9	19.3	311 55.6	11.2	204 11.0	11.9	62 14.6	110	9 24.5	+134
23	85 49.0	210 36.7	32.7	94 18.7	18.5	326 58.4	11.3	219 13.2	12.0	76 44.6	109	9 37.9	+133
24	100 51.5	225 37.2	−15 33.1	109 19.6	− 4 17.8	342 01.2	+21 11.3	234 15.5	−15 12.0	91 14.5	109	+ 9 51.2	+133
code	—	+ 5	− 3	+ 8	+ 7	+ 28	+ 1	+ 22	− 1				

GMT		SUN GHA	SUN Dec.
	h	° ′	° ′
30	0	179 27.3	−23 13.1
	1	194 27.0	12.9
	2	209 26.7	12.8
	3	224 26.4	•• 12.6
	4	239 26.1	12.5
	5	254 25.8	12.3
	6	269 25.5	−23 12.2
	7	284 25.2	12.0
	8	299 24.9	11.9
	9	314 24.6	•• 11.7
	10	329 24.3	11.6
	11	344 24.0	11.4
	12	359 23.7	−23 11.2
	13	14 23.4	11.1
	14	29 23.1	10.9
	15	44 22.8	•• 10.8
	16	59 22.5	10.6
	17	74 22.2	10.4
	18	89 21.9	−23 10.3
	19	104 21.6	10.1
	20	119 21.3	09.9
	21	134 21.0	•• 09.8
	22	149 20.7	09.6
	23	164 20.4	09.4
31	0	179 20.1	−23 09.3
	1	194 19.8	09.1
	2	209 19.5	08.9
	3	224 19.2	•• 08.8
	4	239 18.9	08.6
	5	254 18.6	08.4
	6	269 18.3	−23 08.3
	7	284 18.0	08.1
	8	299 17.7	07.9
	9	314 17.4	•• 07.7
	10	329 17.1	07.6
	11	344 16.8	07.4
	12	359 16.5	−23 07.2
	13	14 16.2	07.0
	14	29 15.9	06.8
	15	44 15.6	•• 06.7
	16	59 15.3	06.5
	17	74 15.0	06.3
	18	89 14.7	−23 06.1
	19	104 14.4	05.9
	20	119 14.1	05.7
	21	134 13.8	•• 05.6
	22	149 13.5	05.4
	23	164 13.2	05.2
1	0	179 12.9	−23 05.0
	1	194 12.6	04.8
	2	209 12.3	04.6
	3	224 12.0	•• 04.4
	4	239 11.7	04.3
	5	254 11.4	04.1
	6	269 11.1	−23 03.9
	7	284 10.8	03.7
	8	299 10.5	03.5
	9	314 10.2	•• 03.3
	10	329 09.9	03.1
	11	344 09.6	02.9
	12	359 09.3	−23 02.7
	13	14 09.0	02.5
	14	29 08.7	02.3
	15	44 08.4	•• 02.1
	16	59 08.1	01.9
	17	74 07.8	01.7
	18	89 07.5	−23 01.5
	19	104 07.2	01.3
	20	119 06.9	01.1
	21	134 06.6	•• 00.9
	22	149 06.3	00.7
	23	164 06.0	00.5
	24	179 05.7	−23 00.3
code		—	+ 2

STARS

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.2	−40 29.2
5	Achernar	335 59.0	−57 28.1
30	Acrux	173 58.4	−62 50.8
19	Adhara	255 46.6	−28 54.6
10	Aldebaran	291 39.4	+16 25.3
32	Alioth	166 59.0	+56 11.8
34	Alkaid	153 33.4	+49 31.9
55	Al Na'ir	28 38.9	−47 10.9
15	Alnilam	276 30.5	− 1 13.7
25	Alphard	218 38.9	− 8 27.8
41	Alphecca	126 48.3	+26 51.7
1	Alpheratz	358 28.9	+28 50.8
51	Altair	62 51.3	+ 8 44.9
2	Ankaa	353 58.8	−42 33.1
42	Antares	113 20.3	−26 20.0
37	Arcturus	146 35.8	+19 24.7
43	Atria	109 02.1	−68 56.8
22	Avior	234 35.4	−59 21.8
13	Bellatrix	279 18.7	+ 6 18.6
16	Betelg'se	271 48.4	+ 7 24.0
17	Canopus	264 15.0	−52 40.2
12	Capella	281 38.7	+45 57.4
53	Deneb	50 01.8	+45 07.3
28	Denebola	183 18.2	+14 49.2
4	Diphda	349 39.8	−18 14.0
27	Dubhe	194 44.9	+61 59.3
14	Elnath	279 07.6	+28 34.3
47	Eltanin	91 07.0	+51 29.5
54	Enif	34 30.4	+ 9 40.2
56	Fomalhaut	16 12.3	−29 51.7
31	Gacrux	172 49.9	−56 51.5
29	Gienah	176 37.4	−17 17.6
35	Hadar	149 50.5	−60 09.3
6	Hamal	328 50.1	+23 15.2
48	Kaus Aust.	84 42.3	−34 24.5
40	Kochab	137 18.5	+74 20.0
57	Markab	14 22.1	+14 57.9
8	Menkar	315 00.7	+ 3 54.9
36	Menkent	148 59.5	−36 08.9
24	Miapl'dus	221 48.5	−69 31.8
9	Mirfak	309 42.8	+49 42.4
50	Nunki	76 52.9	−26 21.3
52	Peacock	54 28.6	−56 53.0
21	Pollux	244 20.8	+28 08.1
20	Procyon	245 45.2	+ 5 20.4
46	R'alhague	96 47.4	+12 35.4
26	Regulus	208 29.9	+12 11.1
11	Rigel	281 53.8	− 8 15.1
38	Rigil Kent.	140 52.1	−60 38.9
44	Sabik	103 03.1	−15 40.3
3	Schedar	350 30.6	+56 17.8
45	Shaula	97 21.8	−37 04.4
18	Sirius	259 12.0	−16 39.2
33	Spica	159 17.5	−10 55.7
23	Suhail	223 24.4	−43 14.9
49	Vega	81 09.1	+38 44.4
39	Zub'g'bi	137 54.2	−15 51.4

Lat.	Sunrise	Twlt. begins	Moonrise 30	Moonrise 31	Moonrise 1	
N °	h m	h m	h m	h m	h m	h m
72	■	6 55	10 52	10 29	10 04	
70	■	6 46	10 46	10 30	10 13	
68	■	6 39	10 42	10 32	10 21	
66	10 30	6 34	10 38	10 33	10 27	
64	9 51	6 28	10 34	10 34	10 33	
62	9 24	6 22	10 31	10 34	10 38	
60	9 03	6 18	10 29	10 35	10 42	
58	8 46	6 14	10 26	10 36	10 45	
56	8 32	6 10	10 24	10 36	10 49	
54	8 19	6 06	10 22	10 37	10 52	
52	8 08	6 02	10 20	10 37	10 54	
50	7 59	6 00	10 19	10 38	10 57	
45	7 38	5 51	10 15	10 38	11 02	
40	7 22	5 44	10 13	10 39	11 07	
35	7 08	5 36	10 10	10 40	11 11	
30	6 56	5 30	10 08	10 40	11 14	
20	6 35	5 15	10 04	10 42	11 20	
10	6 16	5 01	10 01	10 43	11 26	
0	5 59	4 44	9 57	10 43	11 31	
10	5 42	4 23	9 54	10 44	11 36	
20	5 23	3 58	9 51	10 46	11 42	
30	5 01	3 25	9 47	10 47	11 48	
35	4 48	3 02	9 45	10 47	11 52	
40	4 33	2 31	9 42	10 48	11 56	
45	4 16	1 44	9 39	10 49	12 01	
50	3 53	////	9 36	10 50	12 07	
52	3 43	////	9 34	10 51	12 10	
54	3 31	////	9 32	10 51	12 13	
56	3 17	////	9 30	10 52	12 16	
58	3 00	////	9 28	10 53	12 20	
60	2 40	////	9 26	10 54	12 24	
S						

Lat.	Sunset	Twlt. ends	Moonset 30	Moonset 31	Moonset 1	
N °	h m	h m	h m	h m	h m	h m
72	■	17 10	21 57	24 01	0 01	
70	■	17 18	22 00	23 55	25 57	
68	■	17 25	22 02	23 50	25 43	
66	13 36	17 33	22 03	23 45	25 32	
64	14 15	17 38	22 05	23 42	25 23	
62	14 42	17 43	22 06	23 39	25 15	
60	15 03	17 48	22 07	23 36	25 08	
58	15 20	17 52	22 08	23 34	25 02	
56	15 34	17 55	22 09	23 32	24 57	
54	15 47	18 00	22 10	23 30	24 52	
52	15 58	18 03	22 10	23 28	24 48	
50	16 07	18 06	22 11	23 26	24 44	
45	16 28	18 14	22 12	23 23	24 36	
40	16 44	18 21	22 14	23 20	24 29	
35	16 58	18 29	22 15	23 18	24 23	
30	17 10	18 35	22 15	23 16	24 18	
20	17 31	18 50	22 17	23 12	24 09	
10	17 49	19 04	22 18	23 09	24 02	
0	18 07	19 22	22 19	23 06	23 54	
10	18 24	19 42	22 20	23 03	23 47	
20	18 42	20 06	22 22	23 00	23 39	
30	19 04	20 40	22 23	22 56	23 30	
35	19 17	21 03	22 24	22 54	23 25	
40	19 32	21 34	22 25	22 51	23 20	
45	19 49	22 20	22 25	22 49	23 13	
50	20 12	////	22 26	22 45	23 05	
52	20 22	////	22 27	22 44	23 02	
54	20 34	////	22 28	22 42	22 58	
56	20 48	////	22 28	22 40	22 53	
58	21 04	////	22 29	22 38	22 48	
60	21 24	////	22 30	22 36	22 43	
S						

GMT	Equation of Time (App — Mean) 30	31	1
h	m s	m s	m s
0	− 2 10.0	− 2 39.1	− 3 07.9
6	− 2 17.3	− 2 46.4	− 3 15.1
12	− 2 24.6	− 2 53.6	− 3 22.2
18	− 2 31.9	− 3 00.8	− 3 29.3
24	− 2 39.1	− 3 07.9	− 3 36.5

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
30	16 08	9 00	16 46	1 25	8 33
31	16 55	8 59	16 44	1 21	8 29
1	17 43	8 58	16 43	1 16	8 25

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.6	0.3	0.1
30	0.6	0.2	0.1
45	0.6	0.2	0.1
60	0.6	0.1	0.0
75	0.6	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	30	31	1
°	′	′	′
0	15.9	16.6	17.3
4	15.9	16.6	17.3
8	15.9	16.6	17.3
12	15.9	16.5	17.3
16	15.9	16.5	17.3
20	15.9	16.5	17.2
24	15.9	16.5	17.2
28	15.9	16.5	17.1
32	15.9	16.4	17.1
36	15.9	16.4	17.0
40	15.9	16.4	17.0
44	15.8	16.3	16.9
48	15.8	16.3	16.8
52	15.8	16.2	16.8
56	15.8	16.2	16.7
60	15.8	16.1	16.6
64	15.8	16.1	16.5
68	15.7	16.0	16.4
72	15.7	16.0	16.3
76	15.7	15.9	16.2
80	15.7	15.9	16.1
84	15.7	15.8	16.0
88	15.6	15.8	16.0
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	30	31	1
°	′	′	′
0	15.3	15.0	14.5
4	15.3	15.0	14.5
8	15.3	15.0	14.6
12	15.3	15.0	14.6
16	15.3	15.0	14.6
20	15.4	15.0	14.6
24	15.4	15.0	14.7
28	15.4	15.1	14.7
32	15.4	15.1	14.8
36	15.4	15.1	14.8
40	15.4	15.2	14.9
44	15.4	15.2	15.0
48	15.4	15.3	15.0
52	15.5	15.3	15.1
56	15.5	15.3	15.2
60	15.5	15.4	15.3
64	15.5	15.4	15.4
68	15.5	15.5	15.5
72	15.5	15.5	15.5
76	15.6	15.6	15.6
80	15.6	15.7	15.7
84	15.6	15.7	15.8
88	15.6	15.8	15.9
90			

Subtract from table, back cover

New Year's Day 1
First Quarter 1

EXPLANATION AND EXAMPLES

1. Object. The object of this volume is to provide in convenient form the astronomical data required by mariners. In the front part of the book two facing pages give complete data for every hour of three days. The yellow pages give 60 tables, one for every minute of the hour. Each table has two parts. One part (consisting of the first four columns) has 61 lines, one for every second of the minute, used to bring the hourly value of the Greenwich hour angle (GHA) up to the minute and second of observation. The other part (making up the last three columns), with 181 values, is for use in bringing the hourly value of the declination up to the minute of observation; and also for obtaining small corrections to the GHA of the planets and Moon. Altitude correction tables are on the covers, and small additional altitude corrections for the Sun, Moon, Venus, and Mars are on the daily pages.

2. Sun, Moon, planets and *Vernal equinox* (♈). The daily pages give the GHA and Dec. of the Sun, Moon, and four planets at 1-hour intervals, and also a code at the foot of the column (at the right for the Moon) to be used with the yellow table, except for the GHA of the Sun and (♈), where no code is needed. The sign of the code correction is the sign attached to the code on the daily pages; for the Moon's GHA the sign (not printed) is always plus. The magnitudes of the planets are given in the headings.

Example: For 1954 January 2, $16^h\ 23^m\ 12^s$, Greenwich mean time, find the GHA and Dec. of the Sun.

	GHA ° ′	Dec. ° ′	code
(From daily page for Jan. 1, 2, 3) Jan. 2, 16^h	58 59.3	−22 55.7	+2
(From yellow table 23^m, Sun, 12^s) $23^m\ 12^s$	5 48.0		
(From yellow table 23^m, code 2) code correction		+0.1	
The required GHA and Dec.	64 47.3	−22 55.6	

Example: For 1954 January 3, $7^h\ 12^m\ 49^s$ GMT, find the GHA and Dec. of Venus.

	GHA ° ′	code	Dec. ° ′	code
(From daily page for Jan. 1, 2, 3) Jan. 3, 7^h	290 50.3	−10	−23 35.4	0
(From yellow table 12^m, planets, 49^s) $12^m\ 49^s$	3 12.3			
(From yellow table 12^m, codes 10 and 0) code correction	−0.2		0.0	
The required GHA and Dec.	294 02.4		−23 35.4	

Example: For 1954 March 28, $14^h\ 14^m\ 27^s$ GMT, find the GHA and Dec. of the Moon.

	GHA ° ′	code	Dec. ° ′	code
(From daily page for Mar. 26, 27, 28) Mar. 28, 14^h	105 48.6	+90	−22 26.5	+73
(From yellow table 14^m, Moon, 27^s) $14^m\ 27^s$	3 26.9			
(From yellow table 14^m, codes 90 and 73) code correction	+2.2		+1.8	
The required GHA and Dec.	109 17.7		−22 24.7	

3. Stars. The GHA of a star is found by adding the GHA of the vernal equinox to the star's sidereal hour angle:

$$\text{GHA}* = \text{GHA}\Upsilon + \text{SHA}*.$$

On the right-hand daily pages are given the SHA, Dec., and names of 57 stars. The data are for the middle of the second day. The SHA and Dec. may be used without appreciable error for three days. The names and magnitudes of the stars are given inside the front cover, and also on the outside of the back cover.

Example: For 1954 January 2, $17^h\ 44^m\ 19^s$ GMT, find the GHA and Dec. of star 12, Capella.

	GHA ° ′	Dec. ° ′
(From daily page for Jan. 1, 2, 3) SHA and Dec.	281 39.9	+45 57.4
(From daily page for Jan. 1, 2, 3) GHA ♈, Jan. 2, 17^h	356 47.7	
(From yellow table 44^m, ♈, 19^s) $44^m\ 19^s$	11 06.6	
The required GHA, rejecting 360°	289 34.2	

The Greenwich mean time of transit over the meridian of Greenwich may be obtained, if desired, by finding the GMT at which GHA♈ is the same as 360°−SHA*.

The SHA, Dec., and magnitude of 172 stars (including the 57 standard stars) are given for the middle of each month on pages 254–259.

4. Altitude Corrections. Three altitude corrections are given, except for the stars, Jupiter, and Saturn, where only two are needed. The correction for *height of eye*, used for all objects, is inside the front cover. For the *Sun's lower limb*, use also the correction from the Sun table inside the front cover and add the small additional correction from the daily page. For *stars* and *planets*, use (in addition to the dip correction) the correction from the star and planet table inside the front cover, and for *Venus* and *Mars* add the small additional correction from the daily page. For the *Moon*, use (in addition to the dip correction) the correction from the Moon table inside the back cover and apply the additional limb correction from the daily page; the limb corrections are given for 12^h GMT of each day, and may be taken directly out of the table without interpolation.

Example: Correct the following observed altitudes, taken at height 35 feet on 1954 January 3.

	Sun (lower limb)	Moon (upper limb)	Moon (lower limb)	Venus	Polaris
	° ′	° ′	° ′	° ′	° ′
Observed altitude	40 25.5	25 11.7	29 40.1	41 13.6	15 49.3
Height of eye	−5.6	−5.6	−5.6	−5.6	−5.6
Cover tables	+14.7	+49.5	+47.8	−1.1	−3.4
(From daily page) additional correction	+0.6	−15.7	+15.2	+0.1	
Corrected altitude	40 35.2	25 39.9	30 37.5	41 07.0	15 40.3

Caution. In H. O. 218 and in the preliminary edition of H. O. 249, refraction at a height of eye of 5000 feet is already included, and the altitude corrections in this book are not to be used.

Sun's upper limb and *Bubble sextant observations.* If the upper limb of the Sun is observed, correct the altitude as if the lower limb had been observed, and apply the additional correction from the table below.

ADDITIONAL CORRECTION FOR SUN'S UPPER LIMB

(to be applied to the correction for the lower limb)

Dates	Correction	Dates
	′	
Jan. 1 to Jan. 26	−33.8	Dec. 11 to Dec. 31
Jan. 27 to Feb. 14	−33.7	Nov. 23 to Dec. 10
Feb. 15 to Feb. 28	−33.6	Nov. 8 to Nov. 22
Mar. 1 to Mar. 12	−33.5	Oct. 28 to Nov. 7
Mar. 13 to Mar. 23	−33.4	Oct. 16 to Oct. 27
Mar. 24 to Apr. 3	−33.3	Oct. 6 to Oct. 15
Apr. 4 to Apr. 14	−33.2	Sept. 25 to Oct. 5
Apr. 15 to Apr. 25	−33.1	Sept. 13 to Sept. 24
Apr. 26 to May 8	−33.0	Aug. 31 to Sept. 12
May 9 to May 23	−32.9	Aug. 16 to Aug. 30
May 24 to June 16	−32.8	July 24 to Aug. 15
June 17 to July 23	−32.7	

If the center of the Sun or Moon is observed with a bubble sextant, calculate the correction for the two limbs separately, and take the average of the two results; in the case of the Sun, add 0.′6 to this average.

5. *Latitude from Polaris.* The tables on the last white page and the first yellow page give three corrections which must be applied to a corrected altitude of Polaris to get the latitude. All three tables depend on the local hour angle of the vernal equinox. The second table depends also on the date and the third on the corrected altitude.

Example: On 1954 January 3, 13^h 45^m 35^s GMT in longitude 74° West the observed altitude of Polaris was 15° 49.′3. Find the latitude.

	° ′
(From the daily page for Jan. 1, 2, 3) GHA ♈, Jan. 3, 13^h	297 36.9
(From yellow table 45^m, ♈, 35^s) 45^m 35^s	11 25.6
GHA ♈	309 02.5
Longitude west (subtract)	74 00.0
LHA ♈	235 02.5
	° ′
Corrected altitude (from example of section 4)	15 40.3
Correction for LHA ♈, 235°.0	+50.6
Correction for LHA ♈ and date	−0.1
Correction for LHA ♈ and corrected altitude	−0.1
Latitude	16 30.7

The page preceding the other Polaris tables gives the azimuth, depending on LHA ♈ and the latitude.

6. Sunrise, sunset, twilight, moonrise, moonset. Data for finding these for latitudes between 60° south and 72° north are given on the right-hand daily pages. Sunrise, sunset, and the beginning and ending of astronomical twilight are given for the middle day; they are sufficiently accurate for three days. Moonrise and moonset are given for four days for the Greenwich meridian in order to facilitate estimation of times for other longitudes. All times in these columns are local civil times. The precise time of moonrise or moonset is seldom needed; a glance at the table will usually show whether the Moon is up, and favorably placed for observation. If needed, however, the precise time may be obtained as follows. Interpolate for latitude on the day wanted, and also on the preceding day in east longitudes, or the following day in west longitudes. Take the difference between the two results, multiply it by the longitude divided by 360°, and apply the product to the datum for the day wanted, so as to bring the result between the two results previously found.

Example: Find the time of moonrise on 1954 January 3, in longitude 60° west, latitude 42° north.

	h m
January 3, Greenwich, latitude 42° north	6 11
January 4, Greenwich, latitude 42° north	7 04
Difference	53
Correction for longitude, $\frac{60}{360}\times 53$	9
Local civil time of moonrise	6 20
GMT of moonrise ($60° = 4^h$)	10 20

The times of moonrise and moonset are sometimes greater than 24^h. This means that the phenomenon really occurs on the following day but the time is given in this form to facilitate the interpolation. For any given meridian the time of moonrise or moonset is about an hour later (on the average) each succeeding day. If then, on a given day, one of these phenomena occurs shortly before midnight, the next one will occur about 25 hours later which carries it over into the second day.

Some of the phenomena do not occur in high latitudes during certain periods. The symbols used to indicate the exceptions are:

□, Sun or Moon does not set but remains continuously above the horizon.

■, Sun or Moon does not rise but remains continuously below the horizon.

////, Twilight lasts all night.

7. *Equation of time.* This is given on the right-hand daily pages, at intervals of 6 hours. It is to be applied to mean time in order to obtain apparent time.

8. *Meridian transit of Moon and planets.* The GMT of transit of the Moon and planets over the meridian of Greenwich is given for every day on the right-hand daily pages. The LMT of transit over another meridian may be obtained as described for moonrise in section 6.

9. *Accuracy.* Although the quantities in this volume are given to tenths of minutes, in general the GHA and Dec. of an object cannot actually be obtained accurate to 0′.1. The chief reason for loss of accuracy is the error of rounding off; any quantity given to 0′.1 is necessarily subject to an error that may be as large as 0′.05. When several such quantities are added together the errors of rounding may accumulate.

In general, the largest error that can occur in a GHA or Dec. taken from this volume is about 0′.2. In practice it may be expected that two-thirds of the quantities taken out will have errors less than 0′.1, and one-third will have errors between 0′.1 and 0′.2.

In the case of the Sun's GHA the error will on occasions be 0′.1 greater than the figures just given, owing to neglecting the code. This last error has been minimized by adjusting the printed GHA in such a way as to spread the error through the hour.

10. *Using the 1954 Almanac in 1955.* This volume may be used in 1955 for the Sun and stars, with errors generally less than 0′.4, in the following way.

Calculate the GHA of a star for the same date and time and subtract 15′.1. Take out the Dec. of a star for the same date.

For the Sun's GHA use the same date and time and apply the correction from table on page 253.

Take out the Sun's Dec. for a time $5^h\ 49^m$ earlier than the time of observation.

11. *Right ascension.* The right ascensions of objects are not needed in navigation. They may, however, be obtained if desired from the data in this volume.

The right ascension of a star is obtained by subtracting the SHA from 360°, and converting from arc to time by the table on page 260.

Example: Find the right ascension of star 12 Capella on 1954 January 3.

	° ′
	360 00.0
(From daily page for Jan. 1, 2, 3) SHA	281 39.9
Difference	78 20.1

78°	$5^h\ 12^m\ 00^s.0$
20′	1 20.0
0′.1 or 6″	00.4
right ascension	$5^h\ 13^m\ 20^s.4$

The right ascension of the Sun, Moon, or a planet may be obtained by subtracting the GHA of the object from GHA ♈, and converting from arc to time.

Example: Find the right ascension of the Moon on 1954, March 28, $14^h\ 14^m\ 27^s$ GMT.

	♈	Moon	Code
(From the daily page for Mar. 26, 27, 28)	° ′	° ′	
Mar. 28, 14^h	35 27.1	105 48.6	+90
(From the yellow table 14^m, 27^s) $14^m\ 27^s$	3 37.3	3 26.9	
(From yellow table 14^m, code 90) code correction		+2.2	
GHA	39 04.4	109 17.7	

		° ′
Difference		289 46 .7
	289°	$19^h\ 16^m\ 00^s.0$
	46′	3 04 .0
	0′.7 or 42″	02 .8
	Right ascension	$19^h\ 19^m\ 06^s.8$

SUN'S GHA IN 1955

Apply to 1954 value to obtain 1955 value for same date and GMT.

		′			′			′			′			′
Jan.	14	+1.7	Feb.	23	−0.7	May	30	−0.1	Aug.	15	−0.7	Oct.	30	−0.1
	16	+1.6		25	−0.8	June	1	0.0		17	−0.8	Nov.	1	0.0
	17	+1.5		27	−0.9		2	+0.1		19	−0.9		2	+0.1
	18	+1.4	Mar.	14	−1.0		4	+0.2		20	−1.0		3	+0.2
	20	+1.3		17	−1.1		5	+0.3		24	−1.1		5	+0.3
	21	+1.2		19	−1.2		7	+0.4		28	−1.2		8	+0.4
	22	+1.1		21	−1.3		10	+0.5	Sept.	4	−1.1		15	+0.5
	23	+1.0		24	−1.4		14	+0.6		8	−1.0		19	+0.6
	24	+0.9		26	−1.5		18	+0.5		12	−1.1		21	+0.7
	25	+0.8	Apr.	1	−1.6		20	+0.4		14	−1.2		22	+0.8
	26	+0.7		4	−1.5		30	+0.3		17	−1.3		24	+0.9
	28	+0.6		6	−1.4	July	3	+0.4		25	−1.4		25	+1.0
	30	+0.5		8	−1.3		12	+0.5		27	−1.3		26	+1.1
Feb.	2	+0.4		28	−1.2		14	+0.4		29	−1.2		27	+1.2
	8	+0.3		30	−1.1		15	+0.3	Oct.	1	−1.1		28	+1.3
	11	+0.2	May	2	−1.0		17	+0.2		3	−1.0		29	+1.4
	13	+0.1		3	−0.9		18	+0.1		5	−0.9	Dec.	1	+1.5
	15	0.0		4	−0.8		20	0.0		20	−0.8		2	+1.6
	16	−0.1		6	−0.7		21	−0.1		22	−0.7		4	+1.7
	17	−0.2		7	−0.6		24	−0.2		24	−0.6		12	+1.8
	18	−0.3		9	−0.5	Aug.	8	−0.3		26	−0.5		23	+1.7
	20	−0.4		11	−0.4		11	−0.4		27	−0.4		26	+1.8
	21	−0.5		14	−0.3		12	−0.5		28	−0.3		29	+1.9
	22	−0.6		29	−0.2		14	−0.6		29	−0.2		32	+2.0

For a date given in the table, use the upper of the two possible values.

Mag.	Name and No.		SHA	Jan.	Feb.	Mar.	Apr.	May	June	Declination	Jan.	Feb.	Mar.	Apr.	May	June
			°	′	′	′	′	′	′	°	′	′	′	′	′	′
2.2	Alpheratz	1	358	29.8	29.9	29.9	29.8	29.7	29.4	+28	50.4	50.3	50.3	50.2	50.2	50.3
2.4	β Cassiopeiæ		358	19.4	19.6	19.7	19.6	19.3	18.9	+58	54.1	54.0	53.9	53.8	53.7	53.7
2.9	γ Pegasi		357	16.9	17.0	17.0	16.9	16.7	16.5	+14	55.8	55.8	55.7	55.7	55.8	55.8
2.9	β Hydri §		354	09.5	10.0	10.3	10.2	09.8	09.1	−77	31.0	30.9	30.7	30.5	30.3	30.2
2.4	Ankaa	2	353	59.6	59.7	59.7	59.7	59.5	59.3	−42	33.5	33.4	33.3	33.2	33.0	32.9
2.5	Schedar	3	350	31.7	31.9	32.0	31.9	31.7	31.3	+56	17.5	17.4	17.3	17.2	17.1	17.1
2.2	Diphda	4	349	40.6	40.7	40.7	40.6	40.5	40.3	−18	14.4	14.3	14.3	14.2	14.1	14.0
Var.*	γ Cassiopeiæ		346	31.2	31.4	31.5	31.5	31.3	30.9	+60	28.5	28.4	28.3	28.2	28.1	28.1
2.4	β Andromedæ		343	12.6	12.7	12.7	12.7	12.5	12.3	+35	22.9	22.9	22.8	22.7	22.7	22.7
2.8	δ Cassiopeiæ		339	18.0	18.2	18.4	18.3	18.1	17.8	+59	60.2	60.2	60.1	59.9	59.8	59.8
0.6	Achernar	5	335	59.7	59.9	60.1	60.1	60.0	59.8	−57	28.4	28.3	28.2	28.0	27.9	27.7
2.1	Polaris		332	05.5	14.7	21.6	24.0	20.7	13.0	+89	03.4	03.4	03.3	03.1	03.0	02.9
2.7	β Arietis		331	58.3	58.4	58.5	58.5	58.4	58.2	+20	35.2	35.2	35.2	35.1	35.1	35.2
3.0	α Hydri		330	39.9	40.2	40.4	40.5	40.4	40.2	−61	47.8	47.7	47.6	47.5	47.3	47.1
2.2	γ Andromedæ		329	43.7	43.8	43.9	43.9	43.8	43.6	+42	06.9	06.9	06.8	06.7	06.7	06.6
2.2	Hamal	6	328	51.1	51.2	51.2	51.3	51.2	51.0	+23	15.0	14.9	14.9	14.8	14.8	14.9
3.1	β Trianguli		328	17.7	17.8	17.9	17.9	17.8	17.6	+34	46.5	46.5	46.4	46.4	46.3	46.3
3.1	Acamar	7	315	51.9	52.0	52.2	52.3	52.3	52.1	−40	29.4	29.4	29.4	29.3	29.1	28.9
2.8	Menkar	8	315	01.5	01.6	01.7	01.8	01.7	01.6	+ 3	54.7	54.7	54.7	54.7	54.7	54.8
Var.†	β Persei		313	42.0	42.1	42.3	42.4	42.3	42.1	+40	47.1	47.1	47.0	47.0	46.9	46.9
1.9	Mirfak	9	309	44.0	44.2	44.4	44.5	44.4	44.2	+49	42.3	42.3	42.2	42.1	42.1	42.0
3.0	η Tauri		303	48.3	48.4	48.5	48.6	48.6	48.5	+23	58.0	58.0	58.0	58.0	58.0	58.0
2.9	ζ Persei		302	10.9	11.0	11.2	11.3	11.3	11.1	+31	45.1	45.1	45.1	45.1	45.0	45.0
3.0	ε Persei		301	18.0	18.1	18.3	18.4	18.4	18.2	+39	53.0	53.0	53.0	52.9	52.8	52.8
3.2	γ Eridani		301	01.3	01.4	01.5	01.6	01.6	01.5	−13	38.3	38.3	38.3	38.3	38.2	38.1
1.1	Aldebaran	10	291	40.3	40.4	40.5	40.6	40.6	40.5	+16	25.2	25.2	25.2	25.2	25.2	25.2
2.9	ι Aurigæ §		286	29.4	29.5	29.7	29.8	29.8	29.7	+33	05.9	05.9	05.9	05.8	05.8	05.8
2.9	β Eridani		283	35.7	35.7	35.9	36.0	36.0	36.0	− 5	08.7	08.7	08.7	08.7	08.7	08.6
0.3	Rigel	11	281	54.6	54.6	54.8	54.9	54.9	54.9	− 8	15.2	15.3	15.3	15.3	15.2	15.1
0.2	Capella	12	281	39.9	40.0	40.2	40.3	40.4	40.3	+45	57.4	57.4	57.4	57.4	57.3	57.3
1.7	Bellatrix	13	279	19.5	19.6	19.7	19.8	19.8	19.8	+ 6	18.6	18.6	18.6	18.6	18.6	18.6
1.8	Elnath	14	279	08.6	08.7	08.8	08.9	09.0	08.9	+28	34.3	34.4	34.4	34.3	34.3	34.3
3.0	β Leporis		278	25.4	25.4	25.6	25.7	25.8	25.8	−20	47.7	47.8	47.8	47.8	47.7	47.6
2.5	δ Orionis		277	34.6	34.7	34.8	34.9	35.0	34.9	− 0	19.9	19.9	19.9	19.9	19.9	19.8
2.7	α Leporis		277	19.0	19.0	19.2	19.3	19.4	19.3	−17	51.3	51.3	51.4	51.3	51.3	51.2
2.9	ι Orionis		276	41.7	41.8	41.9	42.0	42.1	42.1	− 5	56.3	56.4	56.4	56.4	56.3	56.3
1.8	Alnilam	15	276	31.3	31.3	31.4	31.6	31.6	31.6	− 1	13.8	13.8	13.8	13.8	13.8	13.7
3.0	ζ Tauri		276	16.0	16.0	16.1	16.3	16.3	16.3	+21	07.1	07.1	07.0	07.0	07.0	07.0
2.8	α Columbæ		275	29.7	29.8	30.0	30.2	30.3	30.3	−34	05.9	06.0	06.1	06.0	05.9	05.8
1.9	ζ Orionis		275	22.9	22.9	23.1	23.2	23.2	23.2	− 1	57.9	58.0	58.0	58.0	57.9	57.9
2.2	κ Orionis		273	35.8	35.9	36.0	36.1	36.2	36.2	− 9	41.1	41.2	41.2	41.2	41.1	41.0
Var.‡	Betelgeuse	16	271	49.2	49.2	49.4	49.5	49.5	49.5	+ 7	24.0	24.0	24.0	24.0	24.0	24.0
2.1	β Aurigæ		270	56.9	56.9	57.1	57.3	57.4	57.3	+44	56.8	56.9	56.9	56.9	56.8	56.7
2.7	θ Aurigæ		270	50.5	50.5	50.7	50.8	50.9	50.9	+37	12.8	12.8	12.8	12.8	12.8	12.7
2.0	β Canis Majoris		264	49.3	49.4	49.5	49.6	49.7	49.7	−17	56.0	56.0	56.1	56.1	56.0	55.9
−0.9	Canopus	17	264	15.4	15.5	15.8	16.0	16.3	16.3	−52	40.3	40.4	40.5	40.5	40.4	40.2
1.9	γ Geminorum		261	13.5	13.5	13.6	13.8	13.9	13.9	+16	26.4	26.4	26.4	26.4	26.4	26.4
−1.6	Sirius	18	259	12.6	12.7	12.8	12.9	13.0	13.0	−16	39.1	39.2	39.3	39.3	39.2	39.2
2.8	τ Puppis		257	47.5	47.6	47.8	48.0	48.2	48.3	−50	33.6	33.7	33.8	33.8	33.8	33.7
1.6	Adhara	19	255	47.2	47.2	47.3	47.5	47.6	47.7	−28	54.6	54.7	54.7	54.7	54.7	54.6
3.1	ο Canis Majoris		254	42.9	42.9	43.0	43.2	43.3	43.3	−23	45.9	46.1	46.1	46.1	46.1	46.0
2.0	δ Canis Majoris		253	21.6	21.6	21.8	21.9	22.0	22.1	−26	19.2	19.3	19.4	19.4	19.3	19.2
2.7	π Puppis		251	06.6	06.7	06.8	07.0	07.2	07.2	−37	00.9	01.0	01.1	01.1	01.1	01.0
2.4	η Canis Majoris		249	25.3	25.3	25.4	25.6	25.7	25.8	−29	12.8	12.9	13.0	13.0	13.0	12.9
3.1	β Canis Minoris		248	49.5	49.5	49.6	49.7	49.8	49.8	+ 8	23.0	22.9	22.9	22.9	22.9	23.0
3.3	σ Puppis		248	02.8	02.9	03.0	03.2	03.4	03.5	−43	12.5	12.6	12.7	12.8	12.7	12.6
1.6	α Geminorum		247	04.2	04.2	04.3	04.4	04.6	04.6	+31	59.4	59.5	59.5	59.5	59.5	59.5

*Irregular variable; 1950 Mag. 2.5. †2.3–3.5. ‡0.1–1.2. §Not suitable for use with H. O. 214.

Mag.	Name and No.		SHA °	July ′	Aug. ′	Sept. ′	Oct. ′	Nov. ′	Dec. ′	Declination °	July ′	Aug. ′	Sept. ′	Oct. ′	Nov. ′	Dec. ′
2.2	Alpheratz	1	358	29.1	28.9	28.8	28.8	28.8	28.9	+28	50.4	50.5	50.6	50.7	50.8	50.8
2.4	β Cassiopeiæ		358	18.5	18.2	18.0	18.0	18.1	18.3	+58	53.8	54.0	54.1	54.3	54.4	54.5
2.9	γ Pegasi		357	16.3	16.1	15.9	15.9	15.9	16.0	+14	55.9	56.1	56.1	56.2	56.2	56.2
2.9	β Hydri §		354	08.3	07.6	07.1	07.1	07.5	08.2	−77	30.2	30.2	30.3	30.5	30.6	30.7
2.4	Ankaa	2	353	59.0	58.7	58.6	58.5	58.6	58.7	−42	32.8	32.8	32.8	32.9	33.1	33.1
2.5	Schedar	3	350	30.9	30.6	30.4	30.3	30.4	30.5	+56	17.2	17.3	17.5	17.6	17.8	17.8
2.2	Diphda	4	349	40.0	39.8	39.7	39.6	39.6	39.7	−18	13.9	13.8	13.8	13.9	13.9	14.0
Var.*	γ Cassiopeiæ		346	30.5	30.1	29.8	29.7	29.8	29.9	+60	28.1	28.2	28.4	28.6	28.7	28.8
2.4	β Andromedæ		343	12.0	11.8	11.6	11.5	11.5	11.5	+35	22.8	22.9	23.0	23.1	23.2	23.2
2.8	δ Cassiopeiæ		339	17.4	17.0	16.7	16.5	16.5	16.6	+59	59.8	60.0	60.1	60.3	60.4	60.5
0.6	Achernar	5	335	59.4	59.1	58.8	58.7	58.7	58.9	−57	27.6	27.6	27.6	27.8	27.9	28.0
2.1	Polaris		331	62.9	52.4	44.0	39.1	38.8	43.5	+89	02.9	02.9	03.1	03.2	03.4	03.6
2.7	β Arietis		331	57.9	57.7	57.5	57.4	57.3	57.3	+20	35.2	35.3	35.4	35.5	35.5	35.5
3.0	α Hydri		330	39.8	39.4	39.1	38.9	39.0	39.2	−61	47.0	47.0	47.0	47.2	47.3	47.4
2.2	γ Andromedæ		329	43.3	43.0	42.8	42.6	42.5	42.6	+42	06.7	06.8	06.9	07.0	07.1	07.2
2.2	Hamal	6	328	50.7	50.5	50.3	50.1	50.1	50.1	+23	14.9	15.0	15.1	15.2	15.2	15.2
3.1	β Trianguli		328	17.3	17.1	16.8	16.7	16.6	16.6	+34	46.4	46.5	46.6	46.7	46.7	46.8
3.1	Acamar	7	315	51.9	51.6	51.4	51.2	51.1	51.2	−40	28.8	28.7	28.7	28.8	29.0	29.1
2.8	Menkar	8	315	01.4	01.1	00.9	00.8	00.7	00.7	+ 3	54.9	55.0	55.0	55.0	55.0	55.0
Var.†	β Persei		313	41.8	41.5	41.3	41.1	40.9	40.9	+40	46.9	46.9	47.0	47.1	47.2	47.3
1.9	Mirfak	9	309	43.9	43.6	43.3	43.0	42.8	42.8	+49	42.0	42.0	42.1	42.2	42.3	42.4
3.0	η Tauri		303	48.3	48.0	47.8	47.6	47.4	47.3	+23	58.0	58.0	58 1	58.1	58.2	58.2
2.9	ζ Persei		302	10.9	10.6	10.4	10.1	10.0	09.9	+31	45.0	45.1	45.1	45.2	45.2	45.3
3.0	ε Persei		301	18.0	17.7	17.4	17.2	17.0	16.9	+39	52.8	52.8	52.9	52.9	53.0	53.1
3.2	γ Eridani		301	01.4	01.1	00.9	00.7	00.6	00.6	−13	38.0	37.9	37.9	37.9	38.0	38.1
1.1	Aldebaran	10	291	40.3	40.1	39.9	39.6	39.5	39.4	+16	25.2	25.3	25.3	25.3	25.3	25.3
2.9	ι Aurigæ §		286	29.6	29.3	29.0	28.8	28.6	28.4	+33	05.8	05.8	05.8	05.8	05.9	05.9
2.9	β Eridani		283	35.8	35.6	35.4	35.2	35.0	34.9	− 5	08.5	08.4	08.4	08.4	08.5	08.5
0.3	Rigel	11	281	54.8	54.6	54.3	54.1	54.0	53.8	− 8	15.0	14.9	14.9	14.9	15.0	15.1
0.2	Capella	12	281	40.1	39.8	39.5	39.2	38.9	38.8	+45	57.2	57.2	57.2	57.2	57.3	57.3
1.7	Bellatrix	13	279	19.7	19.4	19.2	19.0	18.8	18.7	+ 6	18.7	18.7	18.8	18.8	18.7	18.7
1.8	Elnath	14	279	08.8	08.5	08.3	08.0	07.8	07.7	+28	34.3	34.3	34.3	34.3	34.3	34.3
3.0	β Leporis		278	25.6	25.4	25.2	25.0	24.8	24.7	−20	47.5	47.4	47.4	47.4	47.5	47.6
2.5	δ Orionis		277	34.8	34.6	34.4	34.2	34.0	33.9	− 0	19.8	19.7	19.7	19.7	19.7	19.8
2.7	α Leporis		277	19.2	19.0	18.8	18.6	18.4	18.3	−17	51.1	51.0	50.9	51.0	51.0	51.2
2.9	ι Orionis		276	41.9	41.7	41.5	41.3	41.1	41.0	− 5	56.2	56.1	56.1	56.1	56.1	56.2
1.8	Alnilam	15	276	31.5	31.3	31.0	30.8	30.6	30.5	− 1	13.7	13.6	13.6	13.6	13.6	13.7
3.0	ζ Tauri		276	16.1	15.9	15.7	15.4	15.2	15.1	+21	07.0	07.1	07.1	07.1	07.1	07.0
2.8	α Columbæ		275	30.2	30.0	29.7	29.5	29.3	29.2	−34	05.7	05.5	05.5	05.5	05.6	05.8
1.9	ζ Orionis		275	23.1	22.9	22.7	22.5	22.3	22.1	− 1	57.8	57.7	57.7	57.7	57.8	57.9
2.2	κ Orionis		273	36.1	35.9	35.7	35.5	35.3	35.1	− 9	40.9	40.9	40.8	40.8	40.9	41.0
Var.‡	Betelgeuse	16	271	49.4	49.2	49.0	48.8	48.6	48.4	+ 7	24.1	24.1	24.2	24.1	24.1	24.0
2.1	β Aurigæ		270	57.2	56.9	56.6	56.3	56.0	55.8	+44	56.7	56.6	56.6	56.6	56.7	56.7
2.7	θ Aurigæ		270	50.7	50.5	50.2	50.0	49.7	49.5	+37	12.7	12.7	12.6	12.6	12.7	12.7
2.0	β Canis Majoris		264	49.7	49.5	49.3	49.1	48.9	48.7	−17	55.8	55.7	55.7	55.7	55.8	55.9
−0.9	Canopus	17	264	16.3	16.1	15.8	15.5	15.2	15.1	−52	40.1	39.9	39.9	39.9	40.0	40.2
1.9	γ Geminorum		261	13.8	13.6	13.4	13.1	12.9	12.7	+16	26.4	26.4	26.4	26.4	26.4	26.3
−1.6	Sirius	18	259	13.0	12.8	12.6	12.4	12.2	12.0	−16	39.1	39.0	38.9	38.9	39.0	39.1
2.8	τ Puppis		257	48.3	48.1	47.9	47.6	47.3	47.1	−50	33.5	33.4	33.3	33.3	33.4	33.5
1.6	Adhara	19	255	47.6	47.5	47.3	47.0	46.8	46.6	−28	54.5	54.4	54.3	54.3	54.4	54.5
3.1	ο Canis Majoris		254	43.3	43.1	42.9	42.7	42.5	42.3	−23	45.9	45.8	45.7	45.7	45.8	45.9
2.0	δ Canis Majoris		253	22.0	21.9	21.7	21.5	21.3	21.1	−26	19.1	19.0	19.0	19.0	19.0	19.2
2.7	π Puppis		251	07.2	07.1	06.9	06.6	06.4	06.2	−37	00.8	00.7	00.6	00.6	00.7	00.9
2.4	η Canis Majoris		249	25.8	25.6	25.4	25.2	25.0	24.8	−29	12.8	12.6	12.6	12.6	12.6	12.8
3.1	β Canis Minoris		248	49.8	49.6	49.5	49.2	49.0	48.8	+ 8	23.0	23.0	23.0	23.0	22.9	22.9
3.3	σ Puppis		248	03.5	03.4	03.2	02.9	02.6	02.4	−43	12.5	12.3	12.2	12.2	12.3	12.5
1.6	α Geminorum		247	04.5	04.4	04.2	03.9	03.7	03.4	+31	59.4	59.4	59.4	59.3	59.3	59.2

*Irregular variable; 1950 Mag. 2.5. †2.3–3.5. ‡0.1–1.2. §Not suitable for use with H. O. 214.

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Mag.	Name and No.		SHA							Declination						
				Jan.	Feb.	Mar.	Apr.	May	June		Jan.	Feb.	Mar.	Apr.	May	June
			°	′	′	′	′	′	′	°	′	′	′	′	′	′
0.5	Procyon	20	245	46.0	46.0	46.0	46.1	46.2	46.3	+ 5	20.6	20.5	20.5	20.5	20.5	20.6
1.2	Pollux	21	244	21.7	21.7	21.8	21.9	22.0	22.1	+28	08.3	08.3	08.3	08.3	08.3	08.3
2.3	ζ Puppis		239	29.9	29.9	30.0	30.2	30.4	30.5	−39	52.4	52.5	52.7	52.7	52.7	52.6
2.9	ρ Puppis		238	35.7	35.6	35.7	35.8	36.0	36.1	−24	10.3	10.4	10.5	10.5	10.5	10.4
1.9	γ Velorum		237	57.7	57.7	57.8	58.0	58.2	58.3	−47	12.0	12.2	12.3	12.4	12.4	12.3
1.7	Avior	22	234	35.7	35.8	35.9	36.2	36.5	36.7	−59	21.7	21.8	22.0	22.1	22.1	22.0
2.0	δ Velorum		229	07.8	07.8	08.0	08.2	08.4	08.6	−54	32.3	32.5	32.7	32.8	32.8	32.7
3.1	ι Ursæ Majoris		225	58.1	58.0	58.0	58.2	58.4	58.5	+48	13.3	13.3	13.4	13.5	13.5	13.4
2.2	Suhail	23	223	24.9	24.8	24.9	25.0	25.2	25.4	−43	14.8	14.9	15.1	15.2	15.2	15.1
1.8	Miaplacidus	24	221	48.6	48.6	48.7	49.1	49.5	49.9	−69	31.6	31.8	32.0	32.1	32.1	32.1
2.2	ι Carinæ		221	01.4	01.4	01.5	01.7	02.0	02.2	−59	04.9	05.1	05.2	05.3	05.4	05.3
2.6	κ Velorum		219	49.1	49.0	49.1	49.3	49.5	49.7	−54	48.8	49.0	49.1	49.2	49.3	49.2
2.2	Alphard	25	218	39.5	39.4	39.5	39.5	39.6	39.7	− 8	27.6	27.7	27.8	27.8	27.8	27.7
3.0	N Velorum		217	32.0	31.9	32.0	32.2	32.5	32.7	−56	49.8	50.0	50.2	50.3	50.3	50.3
3.1	ε Leonis		214	10.7	10.6	10.6	10.7	10.8	10.9	+23	59.0	59.0	59.0	59.1	59.1	59.1
1.3	Regulus	26	208	30.6	30.4	30.4	30.5	30.6	30.7	+12	11.4	11.3	11.3	11.4	11.4	11.4
2.3	γ Leonis		205	37.8	37.7	37.6	37.7	37.8	37.9	+20	04.3	04.3	04.3	04.3	04.4	04.4
3.0	θ Carinæ §		199	39.7	39.5	39.5	39.6	39.9	40.2	−64	09.1	09.3	09.5	09.6	09.7	09.7
2.8	μ Velorum		198	47.7	47.5	47.5	47.6	47.7	47.9	−49	10.5	10.7	10.9	11.0	11.1	11.1
2.4	β Ursæ Majoris		195	13.0	12.8	12.7	12.8	13.0	13.2	+56	37.4	37.5	37.6	37.7	37.8	37.8
2.0	Dubhe	27	194	45.5	45.2	45.2	45.3	45.5	45.8	+61	59.6	59.7	59.8	59.9	60.0	60.0
3.2	ψ Ursæ Majoris		193	13.1	12.9	12.8	12.8	13.0	13.1	+44	44.6	44.6	44.7	44.8	44.9	44.9
2.6	δ Leonis		192	04.5	04.3	04.3	04.3	04.4	04.5	+20	46.3	46.3	46.3	46.3	46.4	46.4
2.2	Denebola	28	183	18.8	18.6	18.5	18.5	18.6	18.7	+14	49.5	49.5	49.4	49.5	49.5	49.6
2.5	γ Ursæ Majoris		182	08.1	07.8	07.7	07.7	07.8	08.0	+53	56.6	56.7	56.8	56.9	57.0	57.0
2.9	δ Centauri		178	30.1	29.8	29.7	29.7	29.8	29.9	−50	27.9	28.0	28.2	28.4	28.5	28.5
2.8	Gienah	29	176	38.1	37.9	37.7	37.7	37.7	37.8	−17	17.3	17.4	17.5	17.6	17.6	17.6
1.1	Acrux	30	173	59.1	58.8	58.6	58.5	58.6	58.8	−62	50.5	50.7	50.9	51.0	51.2	51.2
1.6	Gacrux	31	172	50.6	50.3	50.1	50.0	50.1	50.3	−56	51.2	51.4	51.5	51.7	51.8	51.9
2.8	β Corvi		171	60.1	59.9	59.8	59.7	59.8	59.8	−23	08.6	08.7	08.8	08.9	09.0	09.0
2.9	α Muscæ		171	23.3	22.9	22.6	22.5	22.6	22.9	−68	52.8	52.9	53.1	53.3	53.4	53.5
2.4	γ Centauri		170	15.1	14.8	14.6	14.6	14.6	14.7	−48	42.4	42.5	42.7	42.8	42.9	43.0
2.9	γ Virginis		170	09.7	09.5	09.4	09.3	09.4	09.4	− 1	12.0	12.1	12.2	12.2	12.2	12.1
1.5	β Crucis		168	44.4	44.0	43.8	43.7	43.8	43.9	−59	26.1	26.3	26.4	26.6	26.7	26.8
1.7	Alioth	32	166	59.4	59.1	58.9	58.8	58.9	59.1	+56	12.1	12.1	12.2	12.3	12.5	12.6
2.9	α Canum Venat.		166	31.4	31.2	31.0	31.0	31.0	31.1	+38	33.6	33.6	33.6	33.7	33.8	33.9
3.0	ε Virginis		165	01.4	01.1	01.0	00.9	00.9	01.0	+11	12.1	12.0	12.0	12.0	12.1	12.2
2.9	ι Centauri		160	29.6	29.4	29.2	29.1	29.1	29.1	−36	28.2	28.3	28.4	28.5	28.6	28.7
2.2	ζ Ursæ Majoris		159	28.5	28.2	28.0	27.9	27.9	28.1	+55	09.5	09.5	09.5	09.7	09.8	09.9
1.2	Spica	33	159	18.2	18.0	17.8	17.7	17.7	17.8	−10	55.4	55.5	55.6	55.6	55.7	55.6
2.6	ε Centauri		155	45.3	45.0	44.7	44.6	44.6	44.6	−53	13.9	14.0	14.1	14.3	14.4	14.5
1.9	Alkaid	34	153	33.8	33.5	33.3	33.2	33.2	33.3	+49	32.1	32.1	32.1	32.3	32.4	32.5
2.8	η Bootis		151	52.3	52.1	51.9	51.8	51.8	51.8	+18	37.4	37.3	37.3	37.3	37.4	37.5
3.1	ζ Centauri		151	49.9	49.6	49.3	49.2	49.1	49.2	−47	03.7	03.8	03.9	04.0	04.2	04.2
0.9	Hadar	35	149	51.4	51.0	50.7	50.5	50.4	50.5	−60	09.0	09.1	09.2	09.4	09.5	09.6
2.3	Menkent	36	148	60.3	60.0	59.8	59.6	59.6	59.6	−36	08.7	08.8	08.9	09.0	09.0	09.1
0.2	Arcturus	37	146	36.4	36.1	35.9	35.8	35.8	35.8	+19	25.0	24.9	24.9	24.9	25.0	25.1
3.0	γ Bootis		142	26.5	26.2	26.0	25.8	25.8	25.8	+38	30.1	30.1	30.1	30.2	30.3	30.4
2.6	η Centauri		141	51.2	50.9	50.6	50.4	50.3	50.3	−41	57.4	57.5	57.6	57.7	57.7	57.8
0.1	Rigil Kent.	38	140	53.0	52.5	52.2	52.0	51.9	51.9	−60	38.7	38.8	38.9	39.1	39.2	39.3
2.9	α Lupi		140	16.9	16.6	16.3	16.1	16.0	16.0	−47	11.5	11.5	11.6	11.7	11.8	11.9
2.6	ε Bootis		139	15.2	14.9	14.7	14.6	14.5	14.5	+27	15.7	15.6	15.6	15.7	15.8	15.9
2.9	Zubenelgenubi	39	137	54.9	54.6	54.4	54.3	54.2	54.2	−15	51.2	51.3	51.3	51.4	51.4	51.4
2.2	Kochab	40	137	18.0	17.4	16.8	16.5	16.5	16.8	+74	20.2	20.1	20.2	20.3	20.5	20.6
2.8	β Lupi		136	07.2	06.9	06.6	06.4	06.3	06.3	−42	57.0	57.0	57.1	57.2	57.3	57.4
2.7	β Libræ		131	21.9	21.7	21.5	21.3	21.2	21.2	− 9	13.0	13.1	13.1	13.1	13.1	13.1
3.1	γ Trianguli Aust.		131	21.2	20.6	20.1	19.7	19.5	19.5	−68	30.6	30.6	30.7	30.8	31.0	31.1

§Not suitable for use with H. O. 214.

Mag.	Name and No.		SHA							Declination						
				July	Aug.	Sept.	Oct.	Nov.	Dec.		July	Aug.	Sept.	Oct.	Nov.	Dec.
			°	′	′	′	′	′	′	°	′	′	′	′	′	′
0.5	Procyon	20	245	46.2	46.1	45.9	45.7	45.5	45.3	+ 5	20.6	20.6	20.6	20.6	20.5	20.5
1.2	Pollux	21	244	22.0	21.9	21.7	21.4	21.2	20.9	+28	08.3	08.3	08.2	08.2	08.1	08.1
2.3	ζ Puppis		239	30.5	30.4	30.2	30.0	29.7	29.5	−39	52.5	52.3	52.2	52.2	52.3	52.4
2.9	ρ Puppis		238	36.0	36.0	35.8	35.6	35.3	35.1	−24	10.3	10.2	10.2	10.1	10.2	10.3
1.9	γ Velorum		237	58.4	58.3	58.1	57.9	57.6	57.3	−47	12.1	12.0	11.9	11.9	11.9	12.1
1.7	Avior	22	234	36.8	36.8	36.6	36.2	35.9	35.5	−59	21.8	21.7	21.6	21.5	21.6	21.7
2.0	δ Velorum		229	08.7	08.7	08.5	08.2	07.9	07.6	−54	32.6	32.4	32.3	32.2	32.3	32.4
3.1	ι Ursæ Majoris		225	58.5	58.4	58.3	58.0	57.7	57.3	+48	13.4	13.3	13.2	13.0	13.0	12.9
2.2	Suhail	23	223	25.4	25.4	25.3	25.1	24.8	24.5	−43	15.0	14.9	14.8	14.7	14.7	14.9
1.8	Miaplacidus	24	221	50.2	50.3	50.1	49.7	49.1	48.6	−69	32.0	31.8	31.7	31.6	31.6	31.7
2.2	ι Carinæ		221	02.4	02.4	02.3	02.0	01.6	01.2	−59	05.2	05.1	04.9	04.8	04.9	05.0
2.6	κ Velorum		219	49.8	49.8	49.7	49.4	49.1	48.8	−54	49.1	49.0	48.8	48.8	48.8	48.9
2.2	Alphard	25	218	39.8	39.7	39.6	39.4	39.2	39.0	− 8	27.7	27.6	27.6	27.6	27.7	27.8
3.0	N Velorum		217	32.8	32.9	32.7	32.5	32.1	31.8	−56	50.2	50.0	49.9	49.8	49.8	49.9
3.1	ε Leonis		214	10.9	10.9	10.8	10.6	10.3	10.1	+23	59.1	59.1	59.0	58.9	58.8	58.8
1.3	Regulus	26	208	30.7	30.7	30.6	30.4	30.2	30.0	+12	11.4	11.4	11.4	11.3	11.2	11.1
2.3	γ Leonis		205	37.9	37.9	37.9	37.7	37.5	37.2	+20	04.4	04.3	04.3	04.2	04.1	04.0
3.0	θ Carinæ §		199	40.4	40.6	40.6	40.3	39.9	39.5	−64	09.6	09.5	09.4	09.3	09.2	09.3
2.8	μ Velorum		198	48.0	48.1	48.1	47.9	47.6	47.3	−49	11.0	10.9	10.8	10.7	10.7	10.7
2.4	β Ursæ Majoris		195	13.3	13.4	13.4	13.2	12.9	12.5	+56	37.7	37.6	37.5	37.3	37.2	37.1
2.0	Dubhe	27	194	46.0	46.1	46.0	45.9	45.5	45.1	+61	60.0	59.8	59.7	59.5	59.4	59.3
3.2	ψ Ursæ Majoris		193	13.2	13.3	13.3	13.1	12.9	12.6	+44	44.9	44.8	44.7	44.5	44.4	44.3
2.6	δ Leonis		192	04.5	04.6	04.5	04.4	04.2	04.0	+20	46.4	46.4	46.3	46.3	46.1	46.0
2.2	Denebola	28	183	18.7	18.8	18.8	18.7	18.6	18.3	+14	49.6	49.6	49.5	49.5	49.4	49.2
2.5	γ Ursæ Majoris		182	08.2	08.3	08.4	08.3	08.1	07.7	+53	57.0	56.9	56.8	56.6	56.5	56.3
2.9	δ Centauri		178	30.1	30.2	30.2	30.2	29.9	29.6	−50	28.5	28.4	28.3	28.2	28.1	28.1
2.8	Gienah	29	176	37.9	38.0	38.0	37.9	37.8	37.5	−17	17.5	17.5	17.4	17.4	17.4	17.5
1.1	Acrux	30	173	59.1	59.3	59.4	59.4	59.1	58.7	−62	51.2	51.2	51.0	50.9	50.8	50.8
1.6	Gacrux	31	172	50.5	50.6	50.7	50.7	50.4	50.1	−56	51.9	51.8	51.7	51.6	51.5	51.5
2.8	β Corvi		171	59.9	60.0	60.0	60.0	59.8	59.6	−23	08.9	08.9	08.8	08.8	08.8	08.8
2.9	α Muscæ		171	23.2	23.6	23.7	23.7	23.4	22.8	−68	53.5	53.4	53.3	53.2	53.1	53.0
2.4	γ Centauri		170	14.9	15.0	15.1	15.1	14.9	14.5	−48	42.9	42.9	42.8	42.7	42.6	42.6
2.9	γ Virginis		170	09.5	09.6	09.6	09.6	09.4	09.2	− 1	12.1	12.1	12.1	12.1	12.2	12.2
1.5	β Crucis		168	44.1	44.3	44.5	44.4	44.2	43.8	−59	26.8	26.7	26.6	26.5	26.4	26.4
1.7	Alioth	32	166	59.3	59.5	59.6	59.6	59.5	59.2	+56	12.6	12.5	12.4	12.2	12.0	11.9
2.9	α Canum Venat.		166	31.2	31.4	31.4	31.4	31.3	31.1	+38	33.9	33.9	33.8	33.7	33.5	33.4
3.0	ε Virginis		165	01.1	01.2	01.2	01.2	01.1	00.9	+11	12.2	12.2	12.2	12.1	12.0	11.9
2.9	ι Centauri		160	29.2	29.4	29.4	29.4	29.3	29.1	−36	28.7	28.6	28.5	28.5	28.4	28.4
2.2	ζ Ursæ Majoris		159	28.3	28.5	28.7	28.7	28.6	28.3	+55	09.9	09.9	09.8	09.6	09.4	09.3
1.2	Spica	33	159	17.8	17.9	18.0	18.0	17.9	17.6	−10	55.6	55.6	55.5	55.5	55.6	55.6
2.6	ε Centauri		155	44.8	45.0	45.1	45.1	45.0	44.7	−53	14.5	14.5	14.4	14.3	14.2	14.1
1.9	Alkaid	34	153	33.5	33.6	33.8	33.9	33.8	33.6	+49	32.6	32.5	32.4	32.3	32.1	31.9
2.8	η Bootis		151	51.9	52.0	52.1	52.1	52.1	51.9	+18	37.5	37.5	37.5	37.4	37.3	37.2
3.1	ζ Centauri		151	49.3	49.4	49.6	49.6	49.5	49.2	−47	04.2	04.2	04.1	04.0	04.0	03.9
0.9	Hadar	35	149	50.6	50.9	51.1	51.1	51.0	50.7	−60	09.7	09.6	09.5	09.4	09.3	09.3
2.3	Menkent	36	148	59.7	59.8	59.9	59.9	59.8	59.6	−36	09.1	09.1	09.0	08.9	08.9	08.9
0.2	Arcturus	37	146	35.9	36.0	36.1	36.1	36.1	35.9	+19	25.1	25.2	25.1	25.1	24.9	24.8
3.0	γ Bootis		142	26.0	26.1	26.2	26.3	26.3	26.1	+38	30.5	30.5	30.5	30.4	30.2	30.0
2.6	η Centauri		141	50.4	50.6	50.7	50.7	50.7	50.5	−41	57.8	57.8	57.8	57.7	57.6	57.6
0.1	Rigil Kent.	38	140	52.1	52.3	52.6	52.7	52.6	52.3	−60	39.4	39.3	39.3	39.2	39.0	39.0
2.9	α Lupi		140	16.1	16.3	16.4	16.5	16.4	16.2	−47	12.0	12.0	11.9	11.8	11.7	11.7
2.6	ε Bootis		139	14.6	14.8	14.9	15.0	14.9	14.8	+27	16.0	16.0	16.0	15.9	15.8	15.6
2.9	Zubenelgenubi	39	137	54.2	54.3	54.4	54.5	54.4	54.3	−15	51.4	51.4	51.3	51.3	51.3	51.4
2.2	Kochab	40	137	17.3	17.9	18.4	18.8	19.0	18.7	+74	20.7	20.7	20.6	20.4	20.3	20.1
2.8	β Lupi		136	06.4	06.5	06.6	06.7	06.7	06.5	−42	57.4	57.4	57.3	57.3	57.2	57.2
2.7	β Libræ		131	21.2	21.3	21.4	21.5	21.5	21.3	− 9	13.1	13.1	13.0	13.0	13.1	13.1
3.1	γ Trianguli Aust.		131	19.6	20.0	20.3	20.5	20.5	20.2	−68	31.2	31.2	31.2	31.0	30.9	30.8

§ Not suitable for use with H. O. 214

Mag.	Name and No.		SHA							Declination						
				Jan.	Feb.	Mar.	Apr.	May	June		Jan.	Feb.	Mar.	Apr.	May	June
			°	′	′	′	′	′	′	°	′	′	′	′	′	′
3.1	γ Ursæ Minoris §		129	48.6	48.1	47.6	47.2	47.1	47.3	+71	59.4	59.4	59.4	59.5	59.7	59.9
3.0	γ Lupi §		126	58.9	58.6	58.3	58.1	57.9	57.9	−41	00.8	00.8	00.9	01.0	01.1	01.1
2.3	Alphecca	41	126	48.9	48.6	48.4	48.2	48.1	48.1	+26	51.8	51.7	51.7	51.8	51.9	52.0
2.8	α Serpentis		124	29.9	29.7	29.5	29.3	29.2	29.1	+ 6	33.9	33.9	33.8	33.8	33.9	34.0
3.0	β Trianguli Aust.		122	13.9	13.5	13.0	12.6	12.4	12.3	−63	17.3	17.3	17.4	17.5	17.6	17.8
2.5	δ Scorpii		120	35.8	35.5	35.3	35.1	34.9	34.9	−22	29.6	29.7	29.7	29.7	29.8	29.8
2.8	β Scorpii		119	18.5	18.3	18.0	17.8	17.7	17.6	−19	40.9	41.0	41.0	41.1	41.1	41.1
3.0	δ Ophiuchi		117	00.9	00.7	00.5	00.3	00.2	00.1	− 3	34.8	34.9	34.9	34.9	34.9	34.8
2.9	η Draconis		114	09.9	09.6	09.2	08.9	08.7	08.7	+61	36.7	36.6	36.6	36.7	36.9	37.0
1.2	Antares	42	113	21.2	20.9	20.7	20.5	20.3	20.2	−26	19.9	20.0	20.0	20.1	20.1	20.1
2.8	β Herculis		112	56.4	56.2	55.9	55.7	55.6	55.5	+21	35.1	35.0	35.0	35.0	35.1	35.2
2.9	τ Scorpii		111	44.7	44.5	44.2	44.0	43.8	43.7	−28	07.4	07.4	07.4	07.5	07.5	07.5
2.7	ζ Ophiuchi		111	20.6	20.4	20.1	19.9	19.8	19.7	−10	28.6	28.7	28.7	28.7	28.7	28.7
3.0	ζ Herculis		110	06.8	06.6	06.3	06.1	06.0	05.9	+31	40.8	40.7	40.7	40.8	40.9	41.0
1.9	Atria	43	109	03.5	03.0	02.4	01.8	01.4	01.3	−68	56.7	56.6	56.7	56.7	56.8	57.0
2.4	ε Scorpii		108	12.3	12.0	11.7	11.5	11.3	11.2	−34	12.7	12.7	12.8	12.8	12.8	12.9
3.1	ζ Aræ		106	17.9	17.6	17.2	16.8	16.5	16.4	−55	55.1	55.1	55.1	55.2	55.3	55.4
2.6	Sabik	44	103	03.9	03.7	03.5	03.2	03.0	02.9	−15	40.3	40.3	40.3	40.3	40.3	40.3
Var.*	α Herculis		101	51.8	51.6	51.4	51.2	51.0	50.9	+14	26.3	26.2	26.2	26.2	26.3	26.4
2.8	β Aræ		99	38.0	37.6	37.3	36.9	36.6	36.4	−55	29.3	29.2	29.2	29.3	29.3	29.4
2.8	υ Scorpii		98	05.5	05.2	05.0	04.7	04.4	04.3	−37	15.7	15.7	15.7	15.7	15.7	15.8
3.0	α Aræ		97	55.8	55.5	55.2	54.8	54.5	54.4	−49	50.5	50.5	50.5	50.5	50.5	50.6
3.0	β Draconis		97	39.5	39.2	38.9	38.6	38.4	38.3	+52	19.8	19.7	19.7	19.7	19.9	20.0
1.7	Shaula	45	97	22.8	22.5	22.2	22.0	21.7	21.6	−37	04.3	04.3	04.3	04.4	04.4	04.4
2.1	Rasalhague	46	96	48.1	47.9	47.7	47.4	47.3	47.2	+12	35.4	35.3	35.2	35.3	35.3	35.4
2.0	θ Scorpii		96	29.8	29.6	29.3	29.0	28.7	28.6	−42	58.2	58.2	58.2	58.2	58.3	58.3
2.5	κ Scorpii		95	10.5	10.2	09.9	09.6	09.4	09.2	−39	00.5	00.5	00.5	00.5	00.5	00.6
2.9	β Ophiuchi		94	42.0	41.9	41.6	41.4	41.2	41.1	+ 4	35.0	34.9	34.9	34.9	34.9	35.0
2.4	Eltanin	47	91	07.3	07.1	06.8	06.5	06.3	06.1	+51	29.4	29.3	29.2	29.3	29.4	29.5
3.1	γ Sagittarii		89	17.2	17.0	16.8	16.5	16.3	16.1	−30	25.6	25.6	25.6	25.6	25.6	25.6
2.8	δ Sagittarii		85	29.3	29.1	28.8	28.6	28.3	28.1	−29	51.0	51.0	51.0	51.0	51.0	51.0
2.0	Kaus Australis	48	84	43.2	43.0	42.8	42.5	42.2	42.0	−34	24.5	24.5	24.5	24.5	24.5	24.5
2.9	λ Sagittarii		83	43.0	42.8	42.6	42.4	42.1	41.9	−25	27.0	27.0	27.0	27.0	26.9	26.9
0.1	Vega	49	81	09.5	09.4	09.1	08.9	08.7	08.5	+38	44.2	44.1	44.1	44.1	44.2	44.3
2.1	Nunki	50	76	53.8	53.6	53.4	53.2	52.9	52.7	−26	21.4	21.4	21.4	21.3	21.3	21.3
2.7	ζ Sagittarii		75	04.7	04.6	04.3	04.1	03.8	03.6	−29	56.9	56.9	56.9	56.8	56.8	56.8
3.0	ζ Aquilæ		74	10.7	10.5	10.3	10.1	09.9	09.7	+13	47.5	47.4	47.4	47.4	47.5	47.6
3.0	π Sagittarii		73	14.6	14.4	14.2	14.0	13.7	13.5	−21	06.0	06.0	05.9	05.9	05.9	05.8
3.2	β Cygni		67	47.2	47.1	46.9	46.7	46.4	46.2	+27	51.6	51.5	51.5	51.5	51.6	51.7
3.0	δ Cygni		64	07.3	07.2	07.0	06.7	06.4	06.2	+45	01.0	00.9	00.8	00.8	00.9	01.0
2.8	γ Aquilæ		63	59.0	58.9	58.7	58.5	58.3	58.1	+10	29.9	29.9	29.8	29.9	29.9	30.0
0.9	Altair	51	62	52.0	51.9	51.7	51.5	51.3	51.1	+ 8	44.7	44.6	44.6	44.6	44.7	44.8
2.3	γ Cygni		54	51.6	51.5	51.4	51.1	50.9	50.6	+40	06.5	06.4	06.3	06.3	06.3	06.5
2.1	Peacock	52	54	29.8	29.6	29.4	29.0	28.6	28.3	−56	53.1	53.0	52.9	52.8	52.8	52.8
3.2	α Indi		51	25.0	24.8	24.6	24.3	24.0	23.7	−47	27.3	27.2	27.1	27.0	26.9	26.9
1.3	Deneb	53	50	02.4	02.3	02.2	01.9	01.6	01.4	+45	07.0	06.8	06.7	06.7	06.7	06.9
2.6	ε Cygni		48	55.0	54.9	54.8	54.5	54.3	54.0	+33	47.9	47.7	47.7	47.6	47.7	47.8
2.6	α Cephei		40	38.4	38.4	38.2	37.9	37.5	37.1	+62	23.6	23.4	23.3	23.2	23.2	23.3
3.1	β Aquarii		37	42.9	42.9	42.8	42.6	42.4	42.1	− 5	46.5	46.5	46.5	46.4	46.4	46.3
2.5	Enif	54	34	31.1	31.1	31.0	30.8	30.6	30.4	+ 9	39.8	39.8	39.7	39.8	39.8	39.9
3.0	δ Capricorni		33	52.4	52.4	52.3	52.1	51.9	51.6	−16	20.3	20.2	20.2	20.1	20.0	20.0
2.2	Al Na' ir	55	28	39.8	39.8	39.7	39.5	39.2	38.9	−47	11.2	11.1	11.0	10.8	10.7	10.6
2.9	α Tucanæ		26	09.5	09.5	09.4	09.2	08.8	08.4	−60	29.5	29.4	29.2	29.1	29.0	28.9
2.2	β Gruis		20	01.0	01.0	01.0	00.8	00.7	00.2	−47	07.7	07.6	07.4	07.3	07.2	07.1
1.3	Fomalhaut	56	16	13.2	13.2	13.2	13.0	12.8	12.6	−29	52.1	52.0	51.9	51.8	51.7	51.6
2.6	β Pegasi		14	36.9	36.9	36.9	36.8	36.5	36.3	+27	50.2	50.1	50.0	50.0	50.0	50.1
2.6	Markab	57	14	22.9	23.0	22.9	22.8	22.6	22.4	+14	57.6	57.5	57.5	57.4	57.5	57.6
3.4	γ Cephei §		5	39.2	39.7	39.8	39.5	38.9	38.1	+77	22.9	22.8	22.7	22.5	22.5	22.5

*3.0–3.7. §Not suitable for use with H. O. 214.

Mag.	Name and No.		SHA	SHA July	SHA Aug.	SHA Sept.	SHA Oct.	SHA Nov.	SHA Dec.	Declination	Dec. July	Dec. Aug.	Dec. Sept.	Dec. Oct.	Dec. Nov.	Dec. Dec.
			°	′	′	′	′	′	′	°	′	′	′	′	′	′
3.1	γ Ursæ Minoris §		129	47.7	48.2	48.7	49.1	49.3	49.2	+71	59.9	60.0	59.9	59.8	59.6	59.4
3.0	γ Lupi §		126	57.9	58.0	58.2	58.3	58.3	58.1	−41	01.2	01.2	01.1	01.1	01.0	01.0
2.3	Alphecca	41	126	48.2	48.3	48.4	48.5	48.5	48.4	+26	52.1	52.1	52.1	52.0	51.9	51.8
2.8	α Serpentis		124	29.2	29.3	29.4	29.5	29.5	29.4	+ 6	34.0	34.1	34.1	34.1	34.0	33.9
3.0	β Trianguli Aust.		122	12.4	12.6	12.9	13.1	13.2	12.9	−63	17.9	17.9	17.9	17.8	17.7	17.5
2.5	δ Scorpii		120	34.9	35.0	35.1	35.2	35.2	35.1	−22	29.8	29.8	29.7	29.7	29.7	29.7
2.8	β Scorpii		119	17.6	17.7	17.9	17.9	18.0	17.8	−19	41.1	41.1	41.0	41.0	41.0	41.0
3.0	δ Ophiuchi		117	00.1	00.2	00.3	00.4	00.4	00.3	− 3	34.8	34.7	34.7	34.7	34.8	34.8
2.9	η Draconis		114	08.9	09.2	09.5	09.8	10.0	10.0	+61	37.2	37.2	37.2	37.1	37.0	36.8
1.2	Antares	42	113	20.2	20.3	20.4	20.5	20.5	20.4	−26	20.1	20.1	20.1	20.1	20.0	20.0
2.8	β Herculis		112	55.6	55.7	55.8	55.9	56.0	55.9	+21	35.3	35.4	35.4	35.3	35.2	35.1
2.9	τ Scorpii		111	43.7	43.8	43.9	44.0	44.1	44.0	−28	07.5	07.5	07.5	07.5	07.5	07.5
2.7	ζ Ophiuchi		111	19.7	19.8	19.9	20.0	20.0	19.9	−10	28.7	28.6	28.6	28.6	28.6	28.7
3.0	ζ Herculis		110	06.0	06.1	06.2	06.4	06.5	06.4	+31	41.1	41.2	41.2	41.2	41.1	40.9
1.9	Atria	43	109	01.3	01.5	01.9	02.3	02.4	02.3	−68	57.1	57.2	57.2	57.1	57.0	56.8
2.4	ε Scorpii		108	11.1	11.2	11.4	11.5	11.5	11.5	−34	12.9	12.9	12.9	12.9	12.8	12.8
3.1	ζ Aræ		106	16.4	16.5	16.7	16.9	17.0	16.9	−55	55.4	55.5	55.5	55.5	55.4	55.3
2.6	Sabik	44	103	02.9	03.0	03.1	03.2	03.2	03.2	−15	40.3	40.3	40.3	40.2	40.2	40.3
Var.*	α Herculis		101	50.9	51.0	51.1	51.2	51.3	51.2	+14	26.5	26.6	26.6	26.6	26.5	26.4
2.8	β Aræ		99	36.4	36.5	36.7	36.9	37.0	36.9	−55	29.5	29.6	29.6	29.6	29.5	29.4
2.8	υ Scorpii		98	04.2	04.3	04.4	04.6	04.7	04.6	−37	15.8	15.8	15.8	15.8	15.8	15.7
3.0	α Aræ		97	54.3	54.4	54.6	54.8	54.9	54.8	−49	50.7	50.7	50.8	50.7	50.7	50.6
3.0	β Draconis		97	38.4	38.5	38.8	39.0	39.2	39.3	+52	20.2	20.3	20.3	20.3	20.2	20.0
1.7	Shaula	45	97	21.5	21.6	21.7	21.9	21.9	21.9	−37	04.5	04.5	04.5	04.5	04.4	04.4
2.1	Rasalhague	46	96	47.1	47.2	47.3	47.4	47.5	47.5	+12	35.5	35.6	35.6	35.6	35.6	35.5
2.0	θ Scorpii		96	28.5	28.6	28.7	28.9	29.0	28.9	−42	58.4	58.4	58.4	58.4	58.3	58.3
2.5	κ Scorpii		95	09.2	09.2	09.4	09.5	09.6	09.6	−39	00.6	00.7	00.7	00.6	00.6	00.5
2.9	β Ophiuchi		94	41.1	41.1	41.2	41.4	41.4	41.4	+ 4	35.1	35.2	35.2	35.2	35.1	35.1
2.4	Eltanin	47	91	06.2	06.3	06.5	06.8	07.0	07.1	+51	29.7	29.8	29.9	29.9	29.8	29.6
3.1	γ Sagittarii		89	16.0	16.0	16.2	16.3	16.4	16.4	−30	25.6	25.7	25.7	25.7	25.6	25.6
2.8	δ Sagittarii		85	28.1	28.1	28.2	28.3	28.4	28.4	−29	51.0	51.0	51.0	51.0	51.0	51.0
2.0	Kaus Australis	48	84	41.9	42.0	42.1	42.2	42.3	42.3	−34	24.5	24.6	24.6	24.6	24.5	24.5
2.9	λ Sagittarii		83	41.9	41.9	42.0	42.1	42.2	42.2	−25	26.9	26.9	26.9	26.9	26.9	26.9
0.1	Vega	49	81	08.4	08.5	08.7	08.9	09.0	09.1	+38	44.5	44.6	44.7	44.7	44.6	44.5
2.1	Nunki	50	76	52.6	52.6	52.7	52.8	52.9	53.0	−26	21.3	21.3	21.3	21.3	21.3	21.3
2.7	ζ Sagittarii		75	03.5	03.5	03.6	03.7	03.8	03.9	−29	56.8	56.8	56.8	56.9	56.8	56.8
3.0	ζ Aquilæ		74	09.6	09.6	09.7	09.9	10.0	10.0	+13	47.7	47.8	47.9	47.9	47.9	47.8
3.0	π Sagittarii		73	13.4	13.4	13.5	13.6	13.7	13.8	−21	05.8	05.8	05.8	05.8	05.8	05.8
3.2	β Cygni		67	46.1	46.1	46.2	46.4	46.5	46.6	+27	51.8	52.0	52.1	52.1	52.0	52.0
3.0	δ Cygni		64	06.1	06.1	06.2	06.4	06.6	06.8	+45	01.2	01.3	01.5	01.5	01.5	01.4
2.8	γ Aguilæ		63	58.0	57.9	58.0	58.1	58.2	58.3	+10	30.1	30.2	30.3	30.3	30.3	30.2
0.9	Altair	51	62	50.9	50.9	51.0	51.1	51.2	51.3	+ 8	44.9	45.0	45.0	45.0	45.0	45.0
2.3	γ Cygni		54	50.5	50.5	50.5	50.7	50.9	51.0	+40	06.6	06.8	06.9	07.0	07.0	06.9
2.1	Peacock	52	54	28.0	27.9	28.0	28.2	28.5	28.6	−56	52.8	52.9	53.0	53.1	53.1	53.0
3.2	α Indi		51	23.5	23.4	23.4	23.6	23.8	23.9	−47	26.9	27.0	27.1	27.1	27.2	27.1
1.3	Deneb	53	50	01.2	01.1	01.2	01.4	01.6	01.8	+45	07.0	07.2	07.3	07.4	07.4	07.4
2.6	ε Cygni		48	53.9	53.8	53.9	54.0	54.2	54.3	+33	48.0	48.1	48.3	48.3	48.3	48.3
2.6	α Cephei		40	36.9	36.8	36.9	37.1	37.5	37.8	+62	23.5	23.7	23.9	24.0	24.0	24.0
3.1	β Aquarii		37	41.9	41.8	41.8	41.9	42.0	42.1	− 5	46.2	46.1	46.1	46.1	46.1	46.2
2.5	Enif	54	34	30.2	30.1	30.1	30.1	30.2	30.3	+ 9	40.0	40.1	40.2	40.3	40.2	40.2
3.0	δ Capricorni		33	51.4	51.3	51.3	51.3	51.5	51.5	−16	19.9	19.9	19.9	19.9	19.9	19.9
2.2	Al Na' ir	55	28	38.6	38.4	38.4	38.5	38.7	38.8	−47	10.6	10.7	10.8	10.9	10.9	10.9
2.9	α Tucanæ		26	08.0	07.8	07.7	07.9	08.1	08.4	−60	28.9	29.0	29.1	29.2	29.3	29.3
2.2	β Gruis		19	59.9	59.7	59.6	59.7	59.9	60.0	−47	07.1	07.1	07.2	07.3	07.4	07.4
1.3	Fomalhaut	56	16	12.3	12.1	12.1	12.1	12.2	12.3	−29	51.5	51.5	51.6	51.6	51.7	51.7
2.6	β Pegasi		14	36.0	35.9	35.8	35.8	35.9	36.0	+27	50.2	50.3	50.4	50.5	50.6	50.6
2.6	Markab	57	14	22.1	22.0	21.9	21.9	22.0	22.1	+14	57.7	57.8	57.9	58.0	58.0	58.0
3.4	γ Cephei §		5	37.3	36.8	36.5	36.6	37.0	37.7	+77	22.6	22.7	22.9	23.1	23.2	23.3

*3.0–3.7.

§Not suitable for use with H. O. 214.

°	h m	°	h m	°	h m	°	h m	°	h m	°	h m
0	0 00	60	4 00	120	8 00	180	12 00	240	16 00	300	20 00
1	0 04	61	4 04	121	8 04	181	12 04	241	16 04	301	20 04
2	0 08	62	4 08	122	8 08	182	12 08	242	16 08	302	20 08
3	0 12	63	4 12	123	8 12	183	12 12	243	16 12	303	20 12
4	0 16	64	4 16	124	8 16	184	12 16	244	16 16	304	20 16
5	0 20	65	4 20	125	8 20	185	12 20	245	16 20	305	20 20
6	0 24	66	4 24	126	8 24	186	12 24	246	16 24	306	20 24
7	0 28	67	4 28	127	8 28	187	12 28	247	16 28	307	20 28
8	0 32	68	4 32	128	8 32	188	12 32	248	16 32	308	20 32
9	0 36	69	4 36	129	8 36	189	12 36	249	16 36	309	20 36
10	0 40	70	4 40	130	8 40	190	12 40	250	16 40	310	20 40
11	0 44	71	4 44	131	8 44	191	12 44	251	16 44	311	20 44
12	0 48	72	4 48	132	8 48	192	12 48	252	16 48	312	20 48
13	0 52	73	4 52	133	8 52	193	12 52	253	16 52	313	20 52
14	0 56	74	4 56	134	8 56	194	12 56	254	16 56	314	20 56
15	1 00	75	5 00	135	9 00	195	13 00	255	17 00	315	21 00
16	1 04	76	5 04	136	9 04	196	13 04	256	17 04	316	21 04
17	1 08	77	5 08	137	9 08	197	13 08	257	17 08	317	21 08
18	1 12	78	5 12	138	9 12	198	13 12	258	17 12	318	21 12
19	1 16	79	5 16	139	9 16	199	13 16	259	17 16	319	21 16
20	1 20	80	5 20	140	9 20	200	13 20	260	17 20	320	21 20
21	1 24	81	5 24	141	9 24	201	13 24	261	17 24	321	21 24
22	1 28	82	5 28	142	9 28	202	13 28	262	17 28	322	21 28
23	1 32	83	5 32	143	9 32	203	13 32	263	17 32	323	21 32
24	1 36	84	5 36	144	9 36	204	13 36	264	17 36	324	21 36
25	1 40	85	5 40	145	9 40	205	13 40	265	17 40	325	21 40
26	1 44	86	5 44	146	9 44	206	13 44	266	17 44	326	21 44
27	1 48	87	5 48	147	9 48	207	13 48	267	17 48	327	21 48
28	1 52	88	5 52	148	9 52	208	13 52	268	17 52	328	21 52
29	1 56	89	5 56	149	9 56	209	13 56	269	17 56	329	21 56
30	2 00	90	6 00	150	10 00	210	14 00	270	18 00	330	22 00
31	2 04	91	6 04	151	10 04	211	14 04	271	18 04	331	22 04
32	2 08	92	6 08	152	10 08	212	14 08	272	18 08	332	22 08
33	2 12	93	6 12	153	10 12	213	14 12	273	18 12	333	22 12
34	2 16	94	6 16	154	10 16	214	14 16	274	18 16	334	22 16
35	2 20	95	6 20	155	10 20	215	14 20	275	18 20	335	22 20
36	2 24	96	6 24	156	10 24	216	14 24	276	18 24	336	22 24
37	2 28	97	6 28	157	10 28	217	14 28	277	18 28	337	22 28
38	2 32	98	6 32	158	10 32	218	14 32	278	18 32	338	22 32
39	2 36	99	6 36	159	10 36	219	14 36	279	18 36	339	22 36
40	2 40	100	6 40	160	10 40	220	14 40	280	18 40	340	22 40
41	2 44	101	6 44	161	10 44	221	14 44	281	18 44	341	22 44
42	2 48	102	6 48	162	10 48	222	14 48	282	18 48	342	22 48
43	2 52	103	6 52	163	10 52	223	14 52	283	18 52	343	22 52
44	2 56	104	6 56	164	10 56	224	14 56	284	18 56	344	22 56
45	3 00	105	7 00	165	11 00	225	15 00	285	19 00	345	23 00
46	3 04	106	7 04	166	11 04	226	15 04	286	19 04	346	23 04
47	3 08	107	7 08	167	11 08	227	15 08	287	19 08	347	23 08
48	3 12	108	7 12	168	11 12	228	15 12	288	19 12	348	23 12
49	3 16	109	7 16	169	11 16	229	15 16	289	19 16	349	23 16
50	3 20	110	7 20	170	11 20	230	15 20	290	19 20	350	23 20
51	3 24	111	7 24	171	11 24	231	15 24	291	19 24	351	23 24
52	3 28	112	7 28	172	11 28	232	15 28	292	19 28	352	23 28
53	3 32	113	7 32	173	11 32	233	15 32	293	19 32	353	23 32
54	3 36	114	7 36	174	11 36	234	15 36	294	19 36	354	23 36
55	3 40	115	7 40	175	11 40	235	15 40	295	19 40	355	23 40
56	3 44	116	7 44	176	11 44	236	15 44	296	19 44	356	23 44
57	3 48	117	7 48	177	11 48	237	15 48	297	19 48	357	23 48
58	3 52	118	7 52	178	11 52	238	15 52	298	19 52	358	23 52
59	3 56	119	7 56	179	11 56	239	15 56	299	19 56	359	23 56
60	4 00	120	8 00	180	12 00	240	16 00	300	20 00	360	24 00

′	m s
0	0 00
1	0 04
2	0 08
3	0 12
4	0 16
5	0 20
6	0 24
7	0 28
8	0 32
9	0 36
10	0 40
11	0 44
12	0 48
13	0 52
14	0 56
15	1 00
16	1 04
17	1 08
18	1 12
19	1 16
20	1 20
21	1 24
22	1 28
23	1 32
24	1 36
25	1 40
26	1 44
27	1 48
28	1 52
29	1 56
30	2 00
31	2 04
32	2 08
33	2 12
34	2 16
35	2 20
36	2 24
37	2 28
38	2 32
39	2 36
40	2 40
41	2 44
42	2 48
43	2 52
44	2 56
45	3 00
46	3 04
47	3 08
48	3 12
49	3 16
50	3 20
51	3 24
52	3 28
53	3 32
54	3 36
55	3 40
56	3 44
57	3 48
58	3 52
59	3 56
60	4 00

″	s
0	0.00
1	0.07
2	0.13
3	0.20
4	0.27
5	0.33
6	0.40
7	0.47
8	0.53
9	0.60
10	0.67
11	0.73
12	0.80
13	0.87
14	0.93
15	1.00
16	1.07
17	1.13
18	1.20
19	1.27
20	1.33
21	1.40
22	1.47
23	1.53
24	1.60
25	1.67
26	1.73
27	1.80
28	1.87
29	1.93
30	2.00
31	2.07
32	2.13
33	2.20
34	2.27
35	2.33
36	2.40
37	2.47
38	2.53
39	2.60
40	2.67
41	2.73
42	2.80
43	2.87
44	2.93
45	3.00
46	3.07
47	3.13
48	3.20
49	3.27
50	3.33
51	3.40
52	3.47
53	3.53
54	3.60
55	3.67
56	3.73
57	3.80
58	3.87
59	3.93
60	4.00

[When the sign is plus, Polaris is east of north; when the sign is minus, it is west of north]

LHA ♈ \ Lat.	+10°	+15°	+20°	+25°	+30°	+35°	+40°	+45°	+50°	+55°	+60°	+65°	+70°
°	°	°	°	°	°	°	°	°	°	°	°	°	°
0	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5	+0.6	+0.6	+0.7	+0.8	+0.9	+1.1	+1.4
10	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.5	0.5	0.6	0.7	0.9
20	+0.1	+0.1	+0.1	+0.1	+0.1	+0.2	+0.2	+0.2	+0.2	+0.2	+0.3	+0.3	+0.4
30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	−0.1	−0.1	−0.1	−0.1	−0.1
40	−0.2	−0.2	−0.2	−0.2	−0.2	−0.2	−0.3	−0.3	−0.3	−0.4	−0.4	−0.5	−0.6
50	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.6	0.6	0.7	0.9	1.1
60	0.5	0.5	0.5	0.6	0.6	0.6	0.7	0.7	0.8	0.9	1.0	1.2	1.5
70	0.6	0.7	0.7	0.7	0.7	0.8	0.8	0.9	1.0	1.1	1.3	1.5	1.9
80	−0.8	−0.8	−0.8	−0.8	−0.9	−0.9	−1.0	−1.1	−1.2	−1.3	−1.5	−1.7	−2.2
90	0.9	0.9	0.9	0.9	1.0	1.0	1.1	1.2	1.3	1.5	1.7	2.0	2.5
100	0.9	0.9	1.0	1.0	1.0	1.1	1.2	1.3	1.4	1.6	1.8	2.2	2.7
110	1.0	1.0	1.0	1.0	1.1	1.1	1.2	1.3	1.5	1.6	1.9	2.2	2.8
120	−1.0	−1.0	−1.0	−1.0	−1.1	−1.2	−1.2	−1.3	−1.5	−1.7	−1.9	−2.2	−2.8
130	0.9	1.0	1.0	1.0	1.1	1.1	1.2	1.3	1.4	1.6	1.8	2.2	2.7
140	0.9	0.9	0.9	1.0	1.0	1.1	1.1	1.2	1.4	1.5	1.7	2.1	2.5
150	0.8	0.8	0.9	0.9	0.9	1.0	1.0	1.1	1.2	1.4	1.6	1.9	2.3
160	−0.7	−0.7	−0.7	−0.8	−0.8	−0.9	−0.9	−1.0	−1.1	−1.2	−1.4	−1.6	−2.0
170	0.6	0.6	0.6	0.6	0.7	0.7	0.8	0.8	0.9	1.0	1.1	1.3	1.6
180	0.4	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.7	0.8	0.9	1.0	1.2
190	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.5	0.6	0.7	0.8
200	−0.1	−0.1	−0.1	−0.1	−0.2	−0.2	−0.2	−0.2	−0.2	−0.2	−0.3	−0.3	−0.4
210	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	+0.1	+0.1	+0.1	+0.1	+0.1
220	+0.2	+0.2	+0.2	+0.2	+0.2	+0.2	+0.3	+0.3	0.3	0.3	0.4	0.5	0.6
230	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.6	0.7	0.8	1.0
240	+0.5	+0.5	+0.5	+0.6	+0.6	+0.6	+0.6	+0.7	+0.8	+0.9	+1.0	+1.2	+1.4
250	0.6	0.7	0.7	0.7	0.7	0.8	0.8	0.9	1.0	1.1	1.2	1.5	1.8
260	0.8	0.8	0.8	0.8	0.9	0.9	1.0	1.0	1.2	1.3	1.5	1.7	2.1
270	0.8	0.9	0.9	0.9	1.0	1.0	1.1	1.2	1.3	1.4	1.6	1.9	2.4
280	+0.9	+0.9	+1.0	+1.0	+1.0	+1.1	+1.2	+1.3	+1.4	+1.6	+1.8	+2.1	+2.6
290	1.0	1.0	1.0	1.0	1.1	1.1	1.2	1.3	1.5	1.6	1.9	2.2	2.7
300	1.0	1.0	1.0	1.0	1.1	1.2	1.2	1.3	1.5	1.6	1.9	2.2	2.8
310	0.9	1.0	1.0	1.0	1.1	1.1	1.2	1.3	1.4	1.6	1.9	2.2	2.7
320	+0.9	+0.9	+0.9	+1.0	+1.0	+1.1	+1.2	+1.2	+1.4	+1.5	+1.8	+2.1	+2.6
330	0.8	0.8	0.9	0.9	0.9	1.0	1.1	1.1	1.3	1.4	1.6	1.9	2.4
340	0.7	0.7	0.8	0.8	0.8	0.9	0.9	1.0	1.1	1.2	1.4	1.7	2.1
350	0.6	0.6	0.6	0.6	0.7	0.7	0.8	0.8	0.9	1.0	1.2	1.4	1.8
360	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5	+0.6	+0.6	+0.7	+0.8	+0.9	+1.1	+1.4

FIRST CORRECTION TO CORRECTED ALTITUDE

LHA T	Corr.	LHA T	Corr.	LHA T	Corr.	LHA T	Corr.	LHA T	Corr.	LHA T	Corr.
°	′	°	′	°	′	°	′	°	′	°	′
0	−50.0	60	−47.9	120	+ 2.7	180	+50.3	240	+48.1	300	− 1.8
1	50.5	61	47.3	121	3.7	181	50.8	241	47.6	301	2.7
2	51.0	62	46.8	122	4.7	182	51.2	242	47.1	302	3.7
3	51.4	63	46.2	123	5.7	183	51.6	243	46.5	303	4.7
4	51.8	64	45.6	124	6.6	184	52.0	244	45.9	304	5.7
5	−52.2	65	−45.0	125	+ 7.6	185	+52.4	245	+45.4	305	− 6.7
6	52.6	66	44.4	126	8.6	186	52.8	246	44.8	306	7.7
7	52.9	67	43.7	127	9.6	187	53.1	247	44.1	307	8.7
8	53.3	68	43.1	128	10.5	188	53.5	248	43.5	308	9.6
9	53.6	69	42.5	129	11.5	189	53.8	249	42.9	309	10.6
10	−53.9	70	−41.8	130	+12.5	190	+54.1	250	+42.2	310	−11.6
11	54.2	71	41.1	131	13.4	191	54.4	251	41.6	311	12.5
12	54.5	72	40.4	132	14.4	192	54.6	252	40.9	312	13.5
13	54.8	73	39.7	133	15.3	193	54.9	253	40.2	313	14.5
14	55.0	74	39.0	134	16.3	194	55.1	254	39.5	314	15.4
15	−55.3	75	−38.3	135	+17.2	195	+55.4	255	+38.8	315	−16.4
16	55.5	76	37.5	136	18.2	196	55.6	256	38.1	316	17.3
17	55.7	77	36.8	137	19.1	197	55.8	257	37.3	317	18.3
18	55.9	78	36.0	138	20.0	198	55.9	258	36.6	318	19.2
19	56.0	79	35.3	139	21.0	199	56.1	259	35.8	319	20.1
20	−56.2	80	−34.5	140	+21.9	200	+56.2	260	+35.1	320	−21.1
21	56.3	81	33.7	141	22.8	201	56.4	261	34.3	321	22.0
22	56.4	82	32.9	142	23.7	202	56.5	262	33.5	322	22.9
23	56.5	83	32.1	143	24.6	203	56.6	263	32.7	323	23.8
24	56.6	84	31.2	144	25.5	204	56.6	264	31.9	324	24.7
25	−56.7	85	−30.4	145	+26.3	205	+56.7	265	+31.1	325	−25.6
26	56.7	86	29.5	146	27.2	206	56.7	266	30.2	326	26.5
27	56.7	87	28.7	147	28.1	207	56.7	267	29.4	327	27.4
28	56.7	88	27.8	148	28.9	208	56.7	268	28.5	328	28.2
29	56.7	89	27.0	149	29.8	209	56.7	269	27.7	329	29.1
30	−56.7	90	−26.1	150	+30.6	210	+56.7	270	+26.8	330	−29.9
31	56.7	91	25.2	151	31.4	211	56.7	271	25.9	331	30.8
32	56.6	92	24.3	152	32.2	212	56.6	272	25.1	332	31.6
33	56.5	93	23.4	153	33.1	213	56.5	273	24.2	333	32.4
34	56.4	94	22.5	154	33.9	214	56.4	274	23.3	334	33.2
35	−56.3	95	−21.6	155	+34.6	215	+56.3	275	+22.4	335	−34.0
36	56.2	96	20.6	156	35.4	216	56.2	276	21.5	336	34.8
37	56.0	97	19.7	157	36.2	217	56.0	277	20.5	337	35.6
38	55.8	98	18.8	158	36.9	218	55.9	278	19.6	338	36.4
39	55.6	99	17.8	159	37.7	219	55.7	279	18.7	339	37.1
40	−55.4	100	−16.9	160	+38.4	220	+55.5	280	+17.8	340	−37.9
41	55.2	101	15.9	161	39.1	221	55.3	281	16.8	341	38.6
42	55.0	102	15.0	162	39.8	222	55.0	282	15.9	342	39.3
43	54.7	103	14.0	163	40.5	223	54.8	283	14.9	343	40.1
44	54.5	104	13.1	164	41.2	224	54.5	284	13.9	344	40.8
45	−54.2	105	−12.1	165	+41.9	225	+54.2	285	+13.0	345	−41.4
46	53.9	106	11.1	166	42.5	226	53.9	286	12.0	346	42.1
47	53.5	107	10.2	167	43.2	227	53.6	287	11.1	347	42.8
48	53.2	108	9.2	168	43.8	228	53.3	288	10.1	348	43.4
49	52.8	109	8.2	169	44.4	229	53.0	289	9.1	349	44.1
50	−52.5	110	− 7.2	170	+45.0	230	+52.6	290	+ 8.1	350	−44.7
51	52.1	111	6.2	171	45.6	231	52.2	291	7.2	351	45.3
52	51.7	112	5.2	172	46.2	232	51.8	292	6.2	352	45.9
53	51.3	113	4.3	173	46.8	233	51.4	293	5.2	353	46.5
54	50.8	114	3.3	174	47.3	234	51.0	294	4.2	354	47.1
55	−50.4	115	− 2.3	175	+47.9	235	+50.6	295	+ 3.2	355	−47.6
56	49.9	116	1.3	176	48.4	236	50.1	296	2.2	356	48.1
57	49.4	117	− 0.3	177	48.9	237	49.6	297	1.2	357	48.6
58	48.9	118	+ 0.7	178	49.4	238	49.2	298	+ 0.2	358	49.1
59	48.4	119	1.7	179	49.9	239	48.7	299	− 0.8	359	49.6
60	−47.9	120	+ 2.7	180	+50.3	240	+48.1	300	− 1.8	360	−50.1

SECOND CORRECTION TO CORRECTED ALTITUDE

LHA♈ \ Date	Jan. 1	Feb. 1	Mar. 1	Apr. 1	May 1	June 1	July 1	Aug. 1	Sept. 1	Oct. 1	Nov. 1	Dec. 1	Dec. 32
°	′	′	′	′	′	′	′	′	′	′	′	′	′
0	+0.1	0.0	−0.1	−0.2	−0.4	−0.4	−0.4	−0.3	−0.1	+0.1	+0.3	+0.4	+0.4
20	+0.1	+0.1	0.0	−0.1	−0.3	−0.4	−0.4	−0.4	−0.2	−0.1	+0.1	+0.3	+0.4
40	+0.1	+0.2	+0.1	0.0	−0.1	−0.3	−0.4	−0.4	−0.3	−0.2	0.0	+0.2	+0.3
60	+0.1	+0.2	+0.2	+0.1	0.0	−0.2	−0.3	−0.3	−0.3	−0.3	−0.1	0.0	+0.2
80	+0.1	+0.2	+0.3	+0.3	+0.2	0.0	−0.2	−0.3	−0.3	−0.3	−0.2	−0.1	+0.1
100	0.0	+0.2	+0.3	+0.3	+0.3	+0.1	0.0	−0.2	−0.3	−0.4	−0.3	−0.2	−0.1
120	0.0	+0.1	+0.3	+0.4	+0.4	+0.3	+0.1	−0.1	−0.2	−0.3	−0.4	−0.4	−0.2
140	0.0	+0.1	+0.2	+0.4	+0.4	+0.4	+0.3	+0.1	−0.1	−0.3	−0.4	−0.4	−0.4
160	−0.1	0.0	+0.2	+0.3	+0.4	+0.4	+0.3	+0.2	0.0	−0.2	−0.3	−0.4	−0.4
180	−0.1	0.0	+0.1	+0.2	+0.4	+0.4	+0.4	+0.3	+0.1	−0.1	−0.3	−0.4	−0.4
200	−0.1	−0.1	0.0	+0.1	+0.3	+0.4	+0.4	+0.4	+0.2	+0.1	−0.1	−0.3	−0.4
220	−0.1	−0.2	−0.1	0.0	+0.1	+0.3	+0.4	+0.4	+0.3	+0.2	0.0	−0.2	−0.3
240	−0.1	−0.2	−0.2	−0.1	0.0	+0.2	+0.3	+0.3	+0.3	+0.3	+0.1	0.0	−0.2
260	−0.1	−0.2	−0.3	−0.3	−0.2	0.0	+0.2	+0.3	+0.3	+0.3	+0.2	+0.1	−0.1
280	0.0	−0.2	−0.3	−0.3	−0.3	−0.1	0.0	+0.2	+0.3	+0.4	+0.3	+0.2	+0.1
300	0.0	−0.1	−0.3	−0.4	−0.4	−0.3	−0.1	+0.1	+0.2	+0.3	+0.4	+0.4	+0.2
320	0.0	−0.1	−0.2	−0.4	−0.4	−0.4	−0.3	−0.1	+0.1	+0.3	+0.4	+0.4	+0.4
340	+0.1	0.0	−0.2	−0.3	−0.4	−0.4	−0.3	−0.2	0.0	+0.2	+0.3	+0.4	+0.4
360	+0.1	0.0	−0.1	−0.2	−0.4	−0.4	−0.4	−0.3	−0.1	+0.1	+0.3	+0.4	+0.4

LATITUDE BY POLARIS, 1954

THIRD CORRECTION TO CORRECTED ALTITUDE

LHA♈ \ Altitude	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°
°	′	′	′	′	′	′	′	′	′	′	′	′	′
0	−0.1	−0.1	−0.1	−0.1	0.0	0.0	0.0	0.0	0.0	0.0	+0.1	+0.1	+0.2
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
40	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
60	−0.1	−0.1	−0.1	−0.1	−0.1	0.0	0.0	0.0	0.0	+0.1	+0.1	+0.2	+0.2
80	−0.2	−0.2	−0.2	−0.2	−0.1	−0.1	0.0	0.0	+0.1	+0.1	+0.2	+0.4	+0.5
100	−0.4	−0.3	−0.3	−0.2	−0.2	−0.1	−0.1	0.0	+0.1	+0.2	+0.3	+0.5	+0.7
120	−0.4	−0.3	−0.3	−0.2	−0.2	−0.1	−0.1	0.0	+0.1	+0.2	+0.3	+0.6	+0.8
140	−0.3	−0.3	−0.3	−0.2	−0.2	−0.1	−0.1	0.0	+0.1	+0.2	+0.3	+0.5	+0.7
160	−0.2	−0.2	−0.2	−0.1	−0.1	−0.1	0.0	0.0	+0.1	+0.1	+0.2	+0.3	+0.4
180	−0.1	−0.1	−0.1	−0.1	0.0	0.0	0.0	0.0	0.0	0.0	+0.1	+0.1	+0.2
200	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
220	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
240	−0.1	−0.1	−0.1	−0.1	−0.1	0.0	0.0	0.0	0.0	+0.1	+0.1	+0.2	+0.2
260	−0.2	−0.2	−0.2	−0.2	−0.1	−0.1	0.0	0.0	+0.1	+0.1	+0.2	+0.4	+0.5
280	−0.4	−0.3	−0.3	−0.2	−0.2	−0.1	−0.1	0.0	+0.1	+0.2	+0.3	+0.5	+0.7
300	−0.4	−0.3	−0.3	−0.2	−0.2	−0.1	−0.1	0.0	+0.1	+0.2	+0.3	+0.6	+0.8
320	−0.3	−0.3	−0.3	−0.2	−0.2	−0.1	−0.1	0.0	+0.1	+0.2	+0.3	+0.5	+0.7
340	−0.2	−0.2	−0.2	−0.1	−0.1	−0.1	0.0	0.0	+0.1	+0.1	+0.2	+0.3	+0.4
360	−0.1	−0.1	−0.1	−0.1	0.0	0.0	0.0	0.0	0.0	0.0	+0.1	+0.1	+0.2

992941°—53——16

0m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	0 00.0	0 00.0	0 00.0	0	0.0	60	0.1	120	0.1
1	0 00.3	0 00.3	0 00.2	1	0.0	61	0.1	121	0.1
2	0 00.5	0 00.5	0 00.5	2	0.0	62	0.1	122	0.1
3	0 00.8	0 00.8	0 00.7	3	0.0	63	0.1	123	0.1
4	0 01.0	0 01.0	0 01.0	4	0.0	64	0.1	124	0.1
5	0 01.3	0 01.3	0 01.2	5	0.0	65	0.1	125	0.1
6	0 01.5	0 01.5	0 01.4	6	0.0	66	0.1	126	0.1
7	0 01.8	0 01.8	0 01.7	7	0.0	67	0.1	127	0.1
8	0 02.0	0 02.0	0 01.9	8	0.0	68	0.1	128	0.1
9	0 02.3	0 02.3	0 02.1	9	0.0	69	0.1	129	0.1
10	0 02.5	0 02.5	0 02.4	10	0.0	70	0.1	130	0.1
11	0 02.8	0 02.8	0 02.6	11	0.0	71	0.1	131	0.1
12	0 03.0	0 03.0	0 02.9	12	0.0	72	0.1	132	0.1
13	0 03.3	0 03.3	0 03.1	13	0.0	73	0.1	133	0.1
14	0 03.5	0 03.5	0 03.3	14	0.0	74	0.1	134	0.1
15	0 03.8	0 03.8	0 03.6	15	0.0	75	0.1	135	0.1
16	0 04.0	0 04.0	0 03.8	16	0.0	76	0.1	136	0.1
17	0 04.3	0 04.3	0 04.1	17	0.0	77	0.1	137	0.1
18	0 04.5	0 04.5	0 04.3	18	0.0	78	0.1	138	0.1
19	0 04.8	0 04.8	0 04.5	19	0.0	79	0.1	139	0.1
20	0 05.0	0 05.0	0 04.8	20	0.0	80	0.1	140	0.1
21	0 05.3	0 05.3	0 05.0	21	0.0	81	0.1	141	0.1
22	0 05.5	0 05.5	0 05.2	22	0.0	82	0.1	142	0.1
23	0 05.8	0 05.8	0 05.5	23	0.0	83	0.1	143	0.1
24	0 06.0	0 06.0	0 05.7	24	0.0	84	0.1	144	0.1
25	0 06.3	0 06.3	0 06.0	25	0.0	85	0.1	145	0.1
26	0 06.5	0 06.5	0 06.2	26	0.0	86	0.1	146	0.1
27	0 06.8	0 06.8	0 06.4	27	0.0	87	0.1	147	0.1
28	0 07.0	0 07.0	0 06.7	28	0.0	88	0.1	148	0.1
29	0 07.3	0 07.3	0 06.9	29	0.0	89	0.1	149	0.1
30	0 07.5	0 07.5	0 07.2	30	0.0	90	0.1	150	0.1
31	0 07.8	0 07.8	0 07.4	31	0.0	91	0.1	151	0.1
32	0 08.0	0 08.0	0 07.6	32	0.0	92	0.1	152	0.1
33	0 08.3	0 08.3	0 07.9	33	0.0	93	0.1	153	0.1
34	0 08.5	0 08.5	0 08.1	34	0.0	94	0.1	154	0.1
35	0 08.8	0 08.8	0 08.4	35	0.0	95	0.1	155	0.1
36	0 09.0	0 09.0	0 08.6	36	0.0	96	0.1	156	0.1
37	0 09.3	0 09.3	0 08.8	37	0.0	97	0.1	157	0.1
38	0 09.5	0 09.5	0 09.1	38	0.0	98	0.1	158	0.1
39	0 09.8	0 09.8	0 09.3	39	0.0	99	0.1	159	0.1
40	0 10.0	0 10.0	0 09.5	40	0.0	100	0.1	160	0.1
41	0 10.3	0 10.3	0 09.8	41	0.0	101	0.1	161	0.1
42	0 10.5	0 10.5	0 10.0	42	0.0	102	0.1	162	0.1
43	0 10.8	0 10.8	0 10.3	43	0.0	103	0.1	163	0.1
44	0 11.0	0 11.0	0 10.5	44	0.0	104	0.1	164	0.1
45	0 11.3	0 11.3	0 10.7	45	0.0	105	0.1	165	0.1
46	0 11.5	0 11.5	0 11.0	46	0.0	106	0.1	166	0.1
47	0 11.8	0 11.8	0 11.2	47	0.0	107	0.1	167	0.1
48	0 12.0	0 12.0	0 11.5	48	0.0	108	0.1	168	0.1
49	0 12.3	0 12.3	0 11.7	49	0.0	109	0.1	169	0.1
50	0 12.5	0 12.5	0 11.9	50	0.0	110	0.1	170	0.1
51	0 12.8	0 12.8	0 12.2	51	0.0	111	0.1	171	0.1
52	0 13.0	0 13.0	0 12.4	52	0.0	112	0.1	172	0.1
53	0 13.3	0 13.3	0 12.6	53	0.0	113	0.1	173	0.1
54	0 13.5	0 13.5	0 12.9	54	0.0	114	0.1	174	0.1
55	0 13.8	0 13.8	0 13.1	55	0.0	115	0.1	175	0.1
56	0 14.0	0 14.0	0 13.4	56	0.0	116	0.1	176	0.1
57	0 14.3	0 14.3	0 13.6	57	0.0	117	0.1	177	0.1
58	0 14.5	0 14.5	0 13.8	58	0.0	118	0.1	178	0.1
59	0 14.8	0 14.8	0 14.1	59	0.0	119	0.1	179	0.1
60	0 15.0	0 15.0	0 14.3	60	0.1	120	0.1	180	0.2

1m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	0 15.0	0 15.0	0 14.3	0	0.0	60	0.2	120	0.3
1	0 15.3	0 15.3	0 14.6	1	0.0	61	0.2	121	0.3
2	0 15.5	0 15.5	0 14.8	2	0.0	62	0.2	122	0.3
3	0 15.8	0 15.8	0 15.0	3	0.0	63	0.2	123	0.3
4	0 16.0	0 16.0	0 15.3	4	0.0	64	0.2	124	0.3
5	0 16.3	0 16.3	0 15.5	5	0.0	65	0.2	125	0.3
6	0 16.5	0 16.5	0 15.7	6	0.0	66	0.2	126	0.3
7	0 16.8	0 16.8	0 16.0	7	0.0	67	0.2	127	0.3
8	0 17.0	0 17.0	0 16.2	8	0.0	68	0.2	128	0.3
9	0 17.3	0 17.3	0 16.5	9	0.0	69	0.2	129	0.3
10	0 17.5	0 17.5	0 16.7	10	0.0	70	0.2	130	0.3
11	0 17.8	0 17.8	0 16.9	11	0.0	71	0.2	131	0.3
12	0 18.0	0 18.0	0 17.2	12	0.0	72	0.2	132	0.3
13	0 18.3	0 18.3	0 17.4	13	0.0	73	0.2	133	0.3
14	0 18.5	0 18.6	0 17.7	14	0.0	74	0.2	134	0.3
15	0 18.8	0 18.8	0 17.9	15	0.0	75	0.2	135	0.3
16	0 19.0	0 19.1	0 18.1	16	0.0	76	0.2	136	0.3
17	0 19.3	0 19.3	0 18.4	17	0.0	77	0.2	137	0.3
18	0 19.5	0 19.6	0 18.6	18	0.0	78	0.2	138	0.3
19	0 19.8	0 19.8	0 18.9	19	0.0	79	0.2	139	0.3
20	0 20.0	0 20.1	0 19.1	20	0.1	80	0.2	140	0.4
21	0 20.3	0 20.3	0 19.3	21	0.1	81	0.2	141	0.4
22	0 20.5	0 20.6	0 19.6	22	0.1	82	0.2	142	0.4
23	0 20.8	0 20.8	0 19.8	23	0.1	83	0.2	143	0.4
24	0 21.0	0 21.1	0 20.0	24	0.1	84	0.2	144	0.4
25	0 21.3	0 21.3	0 20.3	25	0.1	85	0.2	145	0.4
26	0 21.5	0 21.6	0 20.5	26	0.1	86	0.2	146	0.4
27	0 21.8	0 21.8	0 20.8	27	0.1	87	0.2	147	0.4
28	0 22.0	0 22.1	0 21.0	28	0.1	88	0.2	148	0.4
29	0 22.3	0 22.3	0 21.2	29	0.1	89	0.2	149	0.4
30	0 22.5	0 22.6	0 21.5	30	0.1	90	0.2	150	0.4
31	0 22.8	0 22.8	0 21.7	31	0.1	91	0.2	151	0.4
32	0 23.0	0 23.1	0 22.0	32	0.1	92	0.2	152	0.4
33	0 23.3	0 23.3	0 22.2	33	0.1	93	0.2	153	0.4
34	0 23.5	0 23.6	0 22.4	34	0.1	94	0.2	154	0.4
35	0 23.8	0 23.8	0 22.7	35	0.1	95	0.2	155	0.4
36	0 24.0	0 24.1	0 22.9	36	0.1	96	0.2	156	0.4
37	0 24.3	0 24.3	0 23.1	37	0.1	97	0.2	157	0.4
38	0 24.5	0 24.6	0 23.4	38	0.1	98	0.2	158	0.4
39	0 24.8	0 24.8	0 23.6	39	0.1	99	0.2	159	0.4
40	0 25.0	0 25.1	0 23.9	40	0.1	100	0.3	160	0.4
41	0 25.3	0 25.3	0 24.1	41	0.1	101	0.3	161	0.4
42	0 25.5	0 25.6	0 24.3	42	0.1	102	0.3	162	0.4
43	0 25.8	0 25.8	0 24.6	43	0.1	103	0.3	163	0.4
44	0 26.0	0 26.1	0 24.8	44	0.1	104	0.3	164	0.4
45	0 26.3	0 26.3	0 25.1	45	0.1	105	0.3	165	0.4
46	0 26.5	0 26.6	0 25.3	46	0.1	106	0.3	166	0.4
47	0 26.8	0 26.8	0 25.5	47	0.1	107	0.3	167	0.4
48	0 27.0	0 27.1	0 25.8	48	0.1	108	0.3	168	0.4
49	0 27.3	0 27.3	0 26.0	49	0.1	109	0.3	169	0.4
50	0 27.5	0 27.6	0 26.2	50	0.1	110	0.3	170	0.4
51	0 27.8	0 27.8	0 26.5	51	0.1	111	0.3	171	0.4
52	0 28.0	0 28.1	0 26.7	52	0.1	112	0.3	172	0.4
53	0 28.3	0 28.3	0 27.0	53	0.1	113	0.3	173	0.4
54	0 28.5	0 28.6	0 27.2	54	0.1	114	0.3	174	0.4
55	0 28.8	0 28.8	0 27.4	55	0.1	115	0.3	175	0.4
56	0 29.0	0 29.1	0 27.7	56	0.1	116	0.3	176	0.4
57	0 29.3	0 29.3	0 27.9	57	0.1	117	0.3	177	0.4
58	0 29.5	0 29.6	0 28.2	58	0.1	118	0.3	178	0.4
59	0 29.8	0 29.8	0 28.4	59	0.1	119	0.3	179	0.4
60	0 30.0	0 30.1	0 28.6	60	0.2	120	0.3	180	0.5

2^m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	0 30.0	0 30.1	0 28.6	0	0.0	60	0.3	120	0.5
1	0 30.3	0 30.3	0 28.9	1	0.0	61	0.3	121	0.5
2	0 30.5	0 30.6	0 29.1	2	0.0	62	0.3	122	0.5
3	0 30.8	0 30.8	0 29.3	3	0.0	63	0.3	123	0.5
4	0 31.0	0 31.1	0 29.6	4	0.0	64	0.3	124	0.5
5	0 31.3	0 31.3	0 29.8	5	0.0	65	0.3	125	0.5
6	0 31.5	0 31.6	0 30.1	6	0.0	66	0.3	126	0.5
7	0 31.8	0 31.8	0 30.3	7	0.0	67	0.3	127	0.5
8	0 32.0	0 32.1	0 30.5	8	0.0	68	0.3	128	0.5
9	0 32.3	0 32.3	0 30.8	9	0.0	69	0.3	129	0.5
10	0 32.5	0 32.6	0 31.0	10	0.0	70	0.3	130	0.5
11	0 32.8	0 32.8	0 31.3	11	0.0	71	0.3	131	0.5
12	0 33.0	0 33.1	0 31.5	12	0.1	72	0.3	132	0.6
13	0 33.3	0 33.3	0 31.7	13	0.1	73	0.3	133	0.6
14	0 33.5	0 33.6	0 32.0	14	0.1	74	0.3	134	0.6
15	0 33.8	0 33.8	0 32.2	15	0.1	75	0.3	135	0.6
16	0 34.0	0 34.1	0 32.5	16	0.1	76	0.3	136	0.6
17	0 34.3	0 34.3	0 32.7	17	0.1	77	0.3	137	0.6
18	0 34.5	0 34.6	0 32.9	18	0.1	78	0.3	138	0.6
19	0 34.8	0 34.8	0 33.2	19	0.1	79	0.3	139	0.6
20	0 35.0	0 35.1	0 33.4	20	0.1	80	0.3	140	0.6
21	0 35.3	0 35.3	0 33.6	21	0.1	81	0.3	141	0.6
22	0 35.5	0 35.6	0 33.9	22	0.1	82	0.3	142	0.6
23	0 35.8	0 35.8	0 34.1	23	0.1	83	0.3	143	0.6
24	0 36.0	0 36.1	0 34.4	24	0.1	84	0.4	144	0.6
25	0 36.3	0 36.3	0 34.6	25	0.1	85	0.4	145	0.6
26	0 36.5	0 36.6	0 34.8	26	0.1	86	0.4	146	0.6
27	0 36.8	0 36.9	0 35.1	27	0.1	87	0.4	147	0.6
28	0 37.0	0 37.1	0 35.3	28	0.1	88	0.4	148	0.6
29	0 37.3	0 37.4	0 35.6	29	0.1	89	0.4	149	0.6
30	0 37.5	0 37.6	0 35.8	30	0.1	90	0.4	150	0.6
31	0 37.8	0 37.9	0 36.0	31	0.1	91	0.4	151	0.6
32	0 38.0	0 38.1	0 36.3	32	0.1	92	0.4	152	0.6
33	0 38.3	0 38.4	0 36.5	33	0.1	93	0.4	153	0.6
34	0 38.5	0 38.6	0 36.7	34	0.1	94	0.4	154	0.6
35	0 38.8	0 38.9	0 37.0	35	0.1	95	0.4	155	0.6
36	0 39.0	0 39.1	0 37.2	36	0.2	96	0.4	156	0.7
37	0 39.3	0 39.4	0 37.5	37	0.2	97	0.4	157	0.7
38	0 39.5	0 39.6	0 37.7	38	0.2	98	0.4	158	0.7
39	0 39.8	0 39.9	0 37.9	39	0.2	99	0.4	159	0.7
40	0 40.0	0 40.1	0 38.2	40	0.2	100	0.4	160	0.7
41	0 40.3	0 40.4	0 38.4	41	0.2	101	0.4	161	0.7
42	0 40.5	0 40.6	0 38.7	42	0.2	102	0.4	162	0.7
43	0 40.8	0 40.9	0 38.9	43	0.2	103	0.4	163	0.7
44	0 41.0	0 41.1	0 39.1	44	0.2	104	0.4	164	0.7
45	0 41.3	0 41.4	0 39.4	45	0.2	105	0.4	165	0.7
46	0 41.5	0 41.6	0 39.6	46	0.2	106	0.4	166	0.7
47	0 41.8	0 41.9	0 39.8	47	0.2	107	0.4	167	0.7
48	0 42.0	0 42.1	0 40.1	48	0.2	108	0.5	168	0.7
49	0 42.3	0 42.4	0 40.3	49	0.2	109	0.5	169	0.7
50	0 42.5	0 42.6	0 40.6	50	0.2	110	0.5	170	0.7
51	0 42.8	0 42.9	0 40.8	51	0.2	111	0.5	171	0.7
52	0 43.0	0 43.1	0 41.0	52	0.2	112	0.5	172	0.7
53	0 43.3	0 43.4	0 41.3	53	0.2	113	0.5	173	0.7
54	0 43.5	0 43.6	0 41.5	54	0.2	114	0.5	174	0.7
55	0 43.8	0 43.9	0 41.8	55	0.2	115	0.5	175	0.7
56	0 44.0	0 44.1	0 42.0	56	0.2	116	0.5	176	0.7
57	0 44.3	0 44.4	0 42.2	57	0.2	117	0.5	177	0.7
58	0 44.5	0 44.6	0 42.5	58	0.2	118	0.5	178	0.7
59	0 44.8	0 44.9	0 42.7	59	0.2	119	0.5	179	0.7
60	0 45.0	0 45.1	0 43.0	60	0.3	120	0.5	180	0.8

3^m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	0 45.0	0 45.1	0 43.0	0	0.0	60	0.4	120	0.7
1	0 45.3	0 45.4	0 43.2	1	0.0	61	0.4	121	0.7
2	0 45.5	0 45.6	0 43.4	2	0.0	62	0.4	122	0.7
3	0 45.8	0 45.9	0 43.7	3	0.0	63	0.4	123	0.7
4	0 46.0	0 46.1	0 43.9	4	0.0	64	0.4	124	0.7
5	0 46.3	0 46.4	0 44.1	5	0.0	65	0.4	125	0.7
6	0 46.5	0 46.6	0 44.4	6	0.0	66	0.4	126	0.7
7	0 46.8	0 46.9	0 44.6	7	0.0	67	0.4	127	0.7
8	0 47.0	0 47.1	0 44.9	8	0.0	68	0.4	128	0.7
9	0 47.3	0 47.4	0 45.1	9	0.1	69	0.4	129	0.8
10	0 47.5	0 47.6	0 45.3	10	0.1	70	0.4	130	0.8
11	0 47.8	0 47.9	0 45.6	11	0.1	71	0.4	131	0.8
12	0 48.0	0 48.1	0 45.8	12	0.1	72	0.4	132	0.8
13	0 48.3	0 48.4	0 46.1	13	0.1	73	0.4	133	0.8
14	0 48.5	0 48.6	0 46.3	14	0.1	74	0.4	134	0.8
15	0 48.8	0 48.9	0 46.5	15	0.1	75	0.4	135	0.8
16	0 49.0	0 49.1	0 46.8	16	0.1	76	0.4	136	0.8
17	0 49.3	0 49.4	0 47.0	17	0.1	77	0.4	137	0.8
18	0 49.5	0 49.6	0 47.2	18	0.1	78	0.5	138	0.8
19	0 49.8	0 49.9	0 47.5	19	0.1	79	0.5	139	0.8
20	0 50.0	0 50.1	0 47.7	20	0.1	80	0.5	140	0.8
21	0 50.3	0 50.4	0 48.0	21	0.1	81	0.5	141	0.8
22	0 50.5	0 50.6	0 48.2	22	0.1	82	0.5	142	0.8
23	0 50.8	0 50.9	0 48.4	23	0.1	83	0.5	143	0.8
24	0 51.0	0 51.1	0 48.7	24	0.1	84	0.5	144	0.8
25	0 51.3	0 51.4	0 48.9	25	0.1	85	0.5	145	0.8
26	0 51.5	0 51.6	0 49.2	26	0.2	86	0.5	146	0.9
27	0 51.8	0 51.9	0 49.4	27	0.2	87	0.5	147	0.9
28	0 52.0	0 52.1	0 49.6	28	0.2	88	0.5	148	0.9
29	0 52.3	0 52.4	0 49.9	29	0.2	89	0.5	149	0.9
30	0 52.5	0 52.6	0 50.1	30	0.2	90	0.5	150	0.9
31	0 52.8	0 52.9	0 50.3	31	0.2	91	0.5	151	0.9
32	0 53.0	0 53.1	0 50.6	32	0.2	92	0.5	152	0.9
33	0 53.3	0 53.4	0 50.8	33	0.2	93	0.5	153	0.9
34	0 53.5	0 53.6	0 51.1	34	0.2	94	0.5	154	0.9
35	0 53.8	0 53.9	0 51.3	35	0.2	95	0.6	155	0.9
36	0 54.0	0 54.1	0 51.5	36	0.2	96	0.6	156	0.9
37	0 54.3	0 54.4	0 51.8	37	0.2	97	0.6	157	0.9
38	0 54.5	0 54.6	0 52.0	38	0.2	98	0.6	158	0.9
39	0 54.8	0 54.9	0 52.3	39	0.2	99	0.6	159	0.9
40	0 55.0	0 55.2	0 52.5	40	0.2	100	0.6	160	0.9
41	0 55.3	0 55.4	0 52.7	41	0.2	101	0.6	161	0.9
42	0 55.5	0 55.7	0 53.0	42	0.2	102	0.6	162	0.9
43	0 55.8	0 55.9	0 53.2	43	0.3	103	0.6	163	1.0
44	0 56.0	0 56.2	0 53.4	44	0.3	104	0.6	164	1.0
45	0 56.3	0 56.4	0 53.7	45	0.3	105	0.6	165	1.0
46	0 56.5	0 56.7	0 53.9	46	0.3	106	0.6	166	1.0
47	0 56.8	0 56.9	0 54.2	47	0.3	107	0.6	167	1.0
48	0 57.0	0 57.2	0 54.4	48	0.3	108	0.6	168	1.0
49	0 57.3	0 57.4	0 54.6	49	0.3	109	0.6	169	1.0
50	0 57.5	0 57.7	0 54.9	50	0.3	110	0.6	170	1.0
51	0 57.8	0 57.9	0 55.1	51	0.3	111	0.6	171	1.0
52	0 58.0	0 58.2	0 55.4	52	0.3	112	0.7	172	1.0
53	0 58.3	0 58.4	0 55.6	53	0.3	113	0.7	173	1.0
54	0 58.5	0 58.7	0 55.8	54	0.3	114	0.7	174	1.0
55	0 58.8	0 58.9	0 56.1	55	0.3	115	0.7	175	1.0
56	0 59.0	0 59.2	0 56.3	56	0.3	116	0.7	176	1.0
57	0 59.3	0 59.4	0 56.6	57	0.3	117	0.7	177	1.0
58	0 59.5	0 59.7	0 56.8	58	0.3	118	0.7	178	1.0
59	0 59.8	0 59.9	0 57.0	59	0.3	119	0.7	179	1.0
60	1 00.0	1 00.2	0 57.3	60	0.4	120	0.7	180	1.1

4m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	1 00.0	1 00.2	0 57.3	0	0.0	60	0.5	120	0.9
1	1 00.3	1 00.4	0 57.5	1	0.0	61	0.5	121	0.9
2	1 00.5	1 00.7	0 57.7	2	0.0	62	0.5	122	0.9
3	1 00.8	1 00.9	0 58.0	3	0.0	63	0.5	123	0.9
4	1 01.0	1 01.2	0 58.2	4	0.0	64	0.5	124	0.9
5	1 01.3	1 01.4	0 58.5	5	0.0	65	0.5	125	0.9
6	1 01.5	1 01.7	0 58.7	6	0.0	66	0.5	126	0.9
7	1 01.8	1 01.9	0 58.9	7	0.1	67	0.5	127	1.0
8	1 02.0	1 02.2	0 59.2	8	0.1	68	0.5	128	1.0
9	1 02.3	1 02.4	0 59.4	9	0.1	69	0.5	129	1.0
10	1 02.5	1 02.7	0 59.7	10	0.1	70	0.5	130	1.0
11	1 02.8	1 02.9	0 59.9	11	0.1	71	0.5	131	1.0
12	1 03.0	1 03.2	1 00.1	12	0.1	72	0.5	132	1.0
13	1 03.3	1 03.4	1 00.4	13	0.1	73	0.5	133	1.0
14	1 03.5	1 03.7	1 00.6	14	0.1	74	0.6	134	1.0
15	1 03.8	1 03.9	1 00.8	15	0.1	75	0.6	135	1.0
16	1 04.0	1 04.2	1 01.1	16	0.1	76	0.6	136	1.0
17	1 04.3	1 04.4	1 01.3	17	0.1	77	0.6	137	1.0
18	1 04.5	1 04.7	1 01.6	18	0.1	78	0.6	138	1.0
19	1 04.8	1 04.9	1 01.8	19	0.1	79	0.6	139	1.0
20	1 05.0	1 05.2	1 02.0	20	0.2	80	0.6	140	1.1
21	1 05.3	1 05.4	1 02.3	21	0.2	81	0.6	141	1.1
22	1 05.5	1 05.7	1 02.5	22	0.2	82	0.6	142	1.1
23	1 05.8	1 05.9	1 02.8	23	0.2	83	0.6	143	1.1
24	1 06.0	1 06.2	1 03.0	24	0.2	84	0.6	144	1.1
25	1 06.3	1 06.4	1 03.2	25	0.2	85	0.6	145	1.1
26	1 06.5	1 06.7	1 03.5	26	0.2	86	0.6	146	1.1
27	1 06.8	1 06.9	1 03.7	27	0.2	87	0.7	147	1.1
28	1 07.0	1 07.2	1 03.9	28	0.2	88	0.7	148	1.1
29	1 07.3	1 07.4	1 04.2	29	0.2	89	0.7	149	1.1
30	1 07.5	1 07.7	1 04.4	30	0.2	90	0.7	150	1.1
31	1 07.8	1 07.9	1 04.7	31	0.2	91	0.7	151	1.1
32	1 08.0	1 08.2	1 04.9	32	0.2	92	0.7	152	1.1
33	1 08.3	1 08.4	1 05.1	33	0.2	93	0.7	153	1.1
34	1 08.5	1 08.7	1 05.4	34	0.3	94	0.7	154	1.2
35	1 08.8	1 08.9	1 05.6	35	0.3	95	0.7	155	1.2
36	1 09.0	1 09.2	1 05.9	36	0.3	96	0.7	156	1.2
37	1 09.3	1 09.4	1 06.1	37	0.3	97	0.7	157	1.2
38	1 09.5	1 09.7	1 06.3	38	0.3	98	0.7	158	1.2
39	1 09.8	1 09.9	1 06.6	39	0.3	99	0.7	159	1.2
40	1 10.0	1 10.2	1 06.8	40	0.3	100	0.8	160	1.2
41	1 10.3	1 10.4	1 07.0	41	0.3	101	0.8	161	1.2
42	1 10.5	1 10.7	1 07.3	42	0.3	102	0.8	162	1.2
43	1 10.8	1 10.9	1 07.5	43	0.3	103	0.8	163	1.2
44	1 11.0	1 11.2	1 07.8	44	0.3	104	0.8	164	1.2
45	1 11.3	1 11.4	1 08.0	45	0.3	105	0.8	165	1.2
46	1 11.5	1 11.7	1 08.2	46	0.3	106	0.8	166	1.2
47	1 11.8	1 11.9	1 08.5	47	0.4	107	0.8	167	1.3
48	1 12.0	1 12.2	1 08.7	48	0.4	108	0.8	168	1.3
49	1 12.3	1 12.4	1 09.0	49	0.4	109	0.8	169	1.3
50	1 12.5	1 12.7	1 09.2	50	0.4	110	0.8	170	1.3
51	1 12.8	1 12.9	1 09.4	51	0.4	111	0.8	171	1.3
52	1 13.0	1 13.2	1 09.7	52	0.4	112	0.8	172	1.3
53	1 13.3	1 13.5	1 09.9	53	0.4	113	0.8	173	1.3
54	1 13.5	1 13.7	1 10.2	54	0.4	114	0.9	174	1.3
55	1 13.8	1 14.0	1 10.4	55	0.4	115	0.9	175	1.3
56	1 14.0	1 14.2	1 10.6	56	0.4	116	0.9	176	1.3
57	1 14.3	1 14.5	1 10.9	57	0.4	117	0.9	177	1.3
58	1 14.5	1 14.7	1 11.1	58	0.4	118	0.9	178	1.3
59	1 14.8	1 15.0	1 11.3	59	0.4	119	0.9	179	1.3
60	1 15.0	1 15.2	1 11.6	60	0.5	120	0.9	180	1.4

5m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	1 15.0	1 15.2	1 11.6	0	0.0	60	0.6	120	1.1
1	1 15.3	1 15.5	1 11.8	1	0.0	61	0.6	121	1.1
2	1 15.5	1 15.7	1 12.1	2	0.0	62	0.6	122	1.1
3	1 15.8	1 16.0	1 12.3	3	0.0	63	0.6	123	1.1
4	1 16.0	1 16.2	1 12.5	4	0.0	64	0.6	124	1.1
5	1 16.3	1 16.5	1 12.8	5	0.0	65	0.6	125	1.1
6	1 16.5	1 16.7	1 13.0	6	0.1	66	0.6	126	1.2
7	1 16.8	1 17.0	1 13.3	7	0.1	67	0.6	127	1.2
8	1 17.0	1 17.2	1 13.5	8	0.1	68	0.6	128	1.2
9	1 17.3	1 17.5	1 13.7	9	0.1	69	0.6	129	1.2
10	1 17.5	1 17.7	1 14.0	10	0.1	70	0.6	130	1.2
11	1 17.8	1 18.0	1 14.2	11	0.1	71	0.7	131	1.2
12	1 18.0	1 18.2	1 14.4	12	0.1	72	0.7	132	1.2
13	1 18.3	1 18.5	1 14.7	13	0.1	73	0.7	133	1.2
14	1 18.5	1 18.7	1 14.9	14	0.1	74	0.7	134	1.2
15	1 18.8	1 19.0	1 15.2	15	0.1	75	0.7	135	1.2
16	1 19.0	1 19.2	1 15.4	16	0.1	76	0.7	136	1.2
17	1 19.3	1 19.5	1 15.6	17	0.2	77	0.7	137	1.3
18	1 19.5	1 19.7	1 15.9	18	0.2	78	0.7	138	1.3
19	1 19.8	1 20.0	1 16.1	19	0.2	79	0.7	139	1.3
20	1 20.0	1 20.2	1 16.4	20	0.2	80	0.7	140	1.3
21	1 20.3	1 20.5	1 16.6	21	0.2	81	0.7	141	1.3
22	1 20.5	1 20.7	1 16.8	22	0.2	82	0.8	142	1.3
23	1 20.8	1 21.0	1 17.1	23	0.2	83	0.8	143	1.3
24	1 21.0	1 21.2	1 17.3	24	0.2	84	0.8	144	1.3
25	1 21.3	1 21.5	1 17.5	25	0.2	85	0.8	145	1.3
26	1 21.5	1 21.7	1 17.8	26	0.2	86	0.8	146	1.3
27	1 21.8	1 22.0	1 18.0	27	0.2	87	0.8	147	1.3
28	1 22.0	1 22.2	1 18.3	28	0.3	88	0.8	148	1.4
29	1 22.3	1 22.5	1 18.5	29	0.3	89	0.8	149	1.4
30	1 22.5	1 22.7	1 18.7	30	0.3	90	0.8	150	1.4
31	1 22.8	1 23.0	1 19.0	31	0.3	91	0.8	151	1.4
32	1 23.0	1 23.2	1 19.2	32	0.3	92	0.8	152	1.4
33	1 23.3	1 23.5	1 19.5	33	0.3	93	0.9	153	1.4
34	1 23.5	1 23.7	1 19.7	34	0.3	94	0.9	154	1.4
35	1 23.8	1 24.0	1 19.9	35	0.3	95	0.9	155	1.4
36	1 24.0	1 24.2	1 20.2	36	0.3	96	0.9	156	1.4
37	1 24.3	1 24.5	1 20.4	37	0.3	97	0.9	157	1.4
38	1 24.5	1 24.7	1 20.7	38	0.3	98	0.9	158	1.4
39	1 24.8	1 25.0	1 20.9	39	0.4	99	0.9	159	1.5
40	1 25.0	1 25.2	1 21.1	40	0.4	100	0.9	160	1.5
41	1 25.3	1 25.5	1 21.4	41	0.4	101	0.9	161	1.5
42	1 25.5	1 25.7	1 21.6	42	0.4	102	0.9	162	1.5
43	1 25.8	1 26.0	1 21.8	43	0.4	103	0.9	163	1.5
44	1 26.0	1 26.2	1 22.1	44	0.4	104	1.0	164	1.5
45	1 26.3	1 26.5	1 22.3	45	0.4	105	1.0	165	1.5
46	1 26.5	1 26.7	1 22.6	46	0.4	106	1.0	166	1.5
47	1 26.8	1 27.0	1 22.8	47	0.4	107	1.0	167	1.5
48	1 27.0	1 27.2	1 23.0	48	0.4	108	1.0	168	1.5
49	1 27.3	1 27.5	1 23.3	49	0.4	109	1.0	169	1.5
50	1 27.5	1 27.7	1 23.5	50	0.5	110	1.0	170	1.6
51	1 27.8	1 28.0	1 23.8	51	0.5	111	1.0	171	1.6
52	1 28.0	1 28.2	1 24.0	52	0.5	112	1.0	172	1.6
53	1 28.3	1 28.5	1 24.2	53	0.5	113	1.0	173	1.6
54	1 28.5	1 28.7	1 24.5	54	0.5	114	1.0	174	1.6
55	1 28.8	1 29.0	1 24.7	55	0.5	115	1.1	175	1.6
56	1 29.0	1 29.2	1 24.9	56	0.5	116	1.1	176	1.6
57	1 29.3	1 29.5	1 25.2	57	0.5	117	1.1	177	1.6
58	1 29.5	1 29.7	1 25.4	58	0.5	118	1.1	178	1.6
59	1 29.8	1 30.0	1 25.7	59	0.5	119	1.1	179	1.6
60	1 30.0	1 30.2	1 25.9	60	0.6	120	1.1	180	1.7

6^m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	1 30.0	1 30.2	1 25.9	0	0.0	60	0.7	120	1.3
1	1 30.3	1 30.5	1 26.1	1	0.0	61	0.7	121	1.3
2	1 30.5	1 30.7	1 26.4	2	0.0	62	0.7	122	1.3
3	1 30.8	1 31.0	1 26.6	3	0.0	63	0.7	123	1.3
4	1 31.0	1 31.2	1 26.9	4	0.0	64	0.7	124	1.3
5	1 31.3	1 31.5	1 27.1	5	0.1	65	0.7	125	1.4
6	1 31.5	1 31.8	1 27.3	6	0.1	66	0.7	126	1.4
7	1 31.8	1 32.0	1 27.6	7	0.1	67	0.7	127	1.4
8	1 32.0	1 32.3	1 27.8	8	0.1	68	0.7	128	1.4
9	1 32.3	1 32.5	1 28.0	9	0.1	69	0.7	129	1.4
10	1 32.5	1 32.8	1 28.3	10	0.1	70	0.8	130	1.4
11	1 32.8	1 33.0	1 28.5	11	0.1	71	0.8	131	1.4
12	1 33.0	1 33.3	1 28.8	12	0.1	72	0.8	132	1.4
13	1 33.3	1 33.5	1 29.0	13	0.1	73	0.8	133	1.4
14	1 33.5	1 33.8	1 29.2	14	0.2	74	0.8	134	1.5
15	1 33.8	1 34.0	1 29.5	15	0.2	75	0.8	135	1.5
16	1 34.0	1 34.3	1 29.7	16	0.2	76	0.8	136	1.5
17	1 34.3	1 34.5	1 30.0	17	0.2	77	0.8	137	1.5
18	1 34.5	1 34.8	1 30.2	18	0.2	78	0.8	138	1.5
19	1 34.8	1 35.0	1 30.4	19	0.2	79	0.9	139	1.5
20	1 35.0	1 35.3	1 30.7	20	0.2	80	0.9	140	1.5
21	1 35.3	1 35.5	1 30.9	21	0.2	81	0.9	141	1.5
22	1 35.5	1 35.8	1 31.1	22	0.2	82	0.9	142	1.5
23	1 35.8	1 36.0	1 31.4	23	0.2	83	0.9	143	1.5
24	1 36.0	1 36.3	1 31.6	24	0.3	84	0.9	144	1.6
25	1 36.3	1 36.5	1 31.9	25	0.3	85	0.9	145	1.6
26	1 36.5	1 36.8	1 32.1	26	0.3	86	0.9	146	1.6
27	1 36.8	1 37.0	1 32.3	27	0.3	87	0.9	147	1.6
28	1 37.0	1 37.3	1 32.6	28	0.3	88	1.0	148	1.6
29	1 37.3	1 37.5	1 32.8	29	0.3	89	1.0	149	1.6
30	1 37.5	1 37.8	1 33.1	30	0.3	90	1.0	150	1.6
31	1 37.8	1 38.0	1 33.3	31	0.3	91	1.0	151	1.6
32	1 38.0	1 38.3	1 33.5	32	0.3	92	1.0	152	1.6
33	1 38.3	1 38.5	1 33.8	33	0.4	93	1.0	153	1.7
34	1 38.5	1 38.8	1 34.0	34	0.4	94	1.0	154	1.7
35	1 38.8	1 39.0	1 34.3	35	0.4	95	1.0	155	1.7
36	1 39.0	1 39.3	1 34.5	36	0.4	96	1.0	156	1.7
37	1 39.3	1 39.5	1 34.7	37	0.4	97	1.1	157	1.7
38	1 39.5	1 39.8	1 35.0	38	0.4	98	1.1	158	1.7
39	1 39.8	1 40.0	1 35.2	39	0.4	99	1.1	159	1.7
40	1 40.0	1 40.3	1 35.4	40	0.4	100	1.1	160	1.7
41	1 40.3	1 40.5	1 35.7	41	0.4	101	1.1	161	1.7
42	1 40.5	1 40.8	1 35.9	42	0.5	102	1.1	162	1.8
43	1 40.8	1 41.0	1 36.2	43	0.5	103	1.1	163	1.8
44	1 41.0	1 41.3	1 36.4	44	0.5	104	1.1	164	1.8
45	1 41.3	1 41.5	1 36.6	45	0.5	105	1.1	165	1.8
46	1 41.5	1 41.8	1 36.9	46	0.5	106	1.1	166	1.8
47	1 41.8	1 42.0	1 37.1	47	0.5	107	1.2	167	1.8
48	1 42.0	1 42.3	1 37.4	48	0.5	108	1.2	168	1.8
49	1 42.3	1 42.5	1 37.6	49	0.5	109	1.2	169	1.8
50	1 42.5	1 42.8	1 37.8	50	0.5	110	1.2	170	1.8
51	1 42.8	1 43.0	1 38.1	51	0.6	111	1.2	171	1.9
52	1 43.0	1 43.3	1 38.3	52	0.6	112	1.2	172	1.9
53	1 43.3	1 43.5	1 38.5	53	0.6	113	1.2	173	1.9
54	1 43.5	1 43.8	1 38.8	54	0.6	114	1.2	174	1.9
55	1 43.8	1 44.0	1 39.0	55	0.6	115	1.2	175	1.9
56	1 44.0	1 44.3	1 39.3	56	0.6	116	1.3	176	1.9
57	1 44.3	1 44.5	1 39.5	57	0.6	117	1.3	177	1.9
58	1 44.5	1 44.8	1 39.7	58	0.6	118	1.3	178	1.9
59	1 44.8	1 45.0	1 40.0	59	0.6	119	1.3	179	1.9
60	1 45.0	1 45.3	1 40.2	60	0.7	120	1.3	180	2.0

7^m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	1 45.0	1 45.3	1 40.2	0	0.0	60	0.8	120	1.5
1	1 45.3	1 45.5	1 40.5	1	0.0	61	0.8	121	1.5
2	1 45.5	1 45.8	1 40.7	2	0.0	62	0.8	122	1.5
3	1 45.8	1 46.0	1 40.9	3	0.0	63	0.8	123	1.5
4	1 46.0	1 46.3	1 41.2	4	0.1	64	0.8	124	1.6
5	1 46.3	1 46.5	1 41.4	5	0.1	65	0.8	125	1.6
6	1 46.5	1 46.8	1 41.6	6	0.1	66	0.8	126	1.6
7	1 46.8	1 47.0	1 41.9	7	0.1	67	0.8	127	1.6
8	1 47.0	1 47.3	1 42.1	8	0.1	68	0.9	128	1.6
9	1 47.3	1 47.5	1 42.4	9	0.1	69	0.9	129	1.6
10	1 47.5	1 47.8	1 42.6	10	0.1	70	0.9	130	1.6
11	1 47.8	1 48.0	1 42.8	11	0.1	71	0.9	131	1.6
12	1 48.0	1 48.3	1 43.1	12	0.2	72	0.9	132	1.7
13	1 48.3	1 48.5	1 43.3	13	0.2	73	0.9	133	1.7
14	1 48.5	1 48.8	1 43.6	14	0.2	74	0.9	134	1.7
15	1 48.8	1 49.0	1 43.8	15	0.2	75	0.9	135	1.7
16	1 49.0	1 49.3	1 44.0	16	0.2	76	1.0	136	1.7
17	1 49.3	1 49.5	1 44.3	17	0.2	77	1.0	137	1.7
18	1 49.5	1 49.8	1 44.5	18	0.2	78	1.0	138	1.7
19	1 49.8	1 50.1	1 44.8	19	0.2	79	1.0	139	1.7
20	1 50.0	1 50.3	1 45.0	20	0.3	80	1.0	140	1.8
21	1 50.3	1 50.6	1 45.2	21	0.3	81	1.0	141	1.8
22	1 50.5	1 50.8	1 45.5	22	0.3	82	1.0	142	1.8
23	1 50.8	1 51.1	1 45.7	23	0.3	83	1.0	143	1.8
24	1 51.0	1 51.3	1 45.9	24	0.3	84	1.1	144	1.8
25	1 51.3	1 51.6	1 46.2	25	0.3	85	1.1	145	1.8
26	1 51.5	1 51.8	1 46.4	26	0.3	86	1.1	146	1.8
27	1 51.8	1 52.1	1 46.7	27	0.3	87	1.1	147	1.8
28	1 52.0	1 52.3	1 46.9	28	0.4	88	1.1	148	1.9
29	1 52.3	1 52.6	1 47.1	29	0.4	89	1.1	149	1.9
30	1 52.5	1 52.8	1 47.4	30	0.4	90	1.1	150	1.9
31	1 52.8	1 53.1	1 47.6	31	0.4	91	1.1	151	1.9
32	1 53.0	1 53.3	1 47.9	32	0.4	92	1.2	152	1.9
33	1 53.3	1 53.6	1 48.1	33	0.4	93	1.2	153	1.9
34	1 53.5	1 53.8	1 48.3	34	0.4	94	1.2	154	1.9
35	1 53.8	1 54.1	1 48.6	35	0.4	95	1.2	155	1.9
36	1 54.0	1 54.3	1 48.8	36	0.5	96	1.2	156	2.0
37	1 54.3	1 54.6	1 49.0	37	0.5	97	1.2	157	2.0
38	1 54.5	1 54.8	1 49.3	38	0.5	98	1.2	158	2.0
39	1 54.8	1 55.1	1 49.5	39	0.5	99	1.2	159	2.0
40	1 55.0	1 55.3	1 49.8	40	0.5	100	1.3	160	2.0
41	1 55.3	1 55.6	1 50.0	41	0.5	101	1.3	161	2.0
42	1 55.5	1 55.8	1 50.2	42	0.5	102	1.3	162	2.0
43	1 55.8	1 56.1	1 50.5	43	0.5	103	1.3	163	2.0
44	1 56.0	1 56.3	1 50.7	44	0.6	104	1.3	164	2.1
45	1 56.3	1 56.6	1 51.0	45	0.6	105	1.3	165	2.1
46	1 56.5	1 56.8	1 51.2	46	0.6	106	1.3	166	2.1
47	1 56.8	1 57.1	1 51.4	47	0.6	107	1.3	167	2.1
48	1 57.0	1 57.3	1 51.7	48	0.6	108	1.4	168	2.1
49	1 57.3	1 57.6	1 51.9	49	0.6	109	1.4	169	2.1
50	1 57.5	1 57.8	1 52.1	50	0.6	110	1.4	170	2.1
51	1 57.8	1 58.1	1 52.4	51	0.6	111	1.4	171	2.1
52	1 58.0	1 58.3	1 52.6	52	0.7	112	1.4	172	2.2
53	1 58.3	1 58.6	1 52.9	53	0.7	113	1.4	173	2.2
54	1 58.5	1 58.8	1 53.1	54	0.7	114	1.4	174	2.2
55	1 58.8	1 59.1	1 53.3	55	0.7	115	1.4	175	2.2
56	1 59.0	1 59.3	1 53.6	56	0.7	116	1.5	176	2.2
57	1 59.3	1 59.6	1 53.8	57	0.7	117	1.5	177	2.2
58	1 59.5	1 59.8	1 54.1	58	0.7	118	1.5	178	2.2
59	1 59.8	2 00.1	1 54.3	59	0.7	119	1.5	179	2.2
60	2 00.0	2 00.3	1 54.5	60	0.8	120	1.5	180	2.3

8^m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	2 00.0	2 00.3	1 54.5	0	0.0	60	0.9	120	1.7
1	2 00.3	2 00.6	1 54.8	1	0.0	61	0.9	121	1.7
2	2 00.5	2 00.8	1 55.0	2	0.0	62	0.9	122	1.7
3	2 00.8	2 01.1	1 55.2	3	0.0	63	0.9	123	1.7
4	2 01.0	2 01.3	1 55.5	4	0.1	64	0.9	124	1.8
5	2 01.3	2 01.6	1 55.7	5	0.1	65	0.9	125	1.8
6	2 01.5	2 01.8	1 56.0	6	0.1	66	0.9	126	1.8
7	2 01.8	2 02.1	1 56.2	7	0.1	67	0.9	127	1.8
8	2 02.0	2 02.3	1 56.4	8	0.1	68	1.0	128	1.8
9	2 02.3	2 02.6	1 56.7	9	0.1	69	1.0	129	1.8
10	2 02.5	2 02.8	1 56.9	10	0.1	70	1.0	130	1.8
11	2 02.8	2 03.1	1 57.2	11	0.2	71	1.0	131	1.9
12	2 03.0	2 03.3	1 57.4	12	0.2	72	1.0	132	1.9
13	2 03.3	2 03.6	1 57.6	13	0.2	73	1.0	133	1.9
14	2 03.5	2 03.8	1 57.9	14	0.2	74	1.0	134	1.9
15	2 03.8	2 04.1	1 58.1	15	0.2	75	1.1	135	1.9
16	2 04.0	2 04.3	1 58.4	16	0.2	76	1.1	136	1.9
17	2 04.3	2 04.6	1 58.6	17	0.2	77	1.1	137	1.9
18	2 04.5	2 04.8	1 58.8	18	0.3	78	1.1	138	2.0
19	2 04.8	2 05.1	1 59.1	19	0.3	79	1.1	139	2.0
20	2 05.0	2 05.3	1 59.3	20	0.3	80	1.1	140	2.0
21	2 05.3	2 05.6	1 59.5	21	0.3	81	1.1	141	2.0
22	2 05.5	2 05.8	1 59.8	22	0.3	82	1.2	142	2.0
23	2 05.8	2 06.1	2 00.0	23	0.3	83	1.2	143	2.0
24	2 06.0	2 06.3	2 00.3	24	0.3	84	1.2	144	2.0
25	2 06.3	2 06.6	2 00.5	25	0.4	85	1.2	145	2.1
26	2 06.5	2 06.8	2 00.7	26	0.4	86	1.2	146	2.1
27	2 06.8	2 07.1	2 01.0	27	0.4	87	1.2	147	2.1
28	2 07.0	2 07.3	2 01.2	28	0.4	88	1.2	148	2.1
29	2 07.3	2 07.6	2 01.5	29	0.4	89	1.3	149	2.1
30	2 07.5	2 07.8	2 01.7	30	0.4	90	1.3	150	2.1
31	2 07.8	2 08.1	2 01.9	31	0.4	91	1.3	151	2.1
32	2 08.0	2 08.4	2 02.2	32	0.5	92	1.3	152	2.2
33	2 08.3	2 08.6	2 02.4	33	0.5	93	1.3	153	2.2
34	2 08.5	2 08.9	2 02.6	34	0.5	94	1.3	154	2.2
35	2 08.8	2 09.1	2 02.9	35	0.5	95	1.3	155	2.2
36	2 09.0	2 09.4	2 03.1	36	0.5	96	1.4	156	2.2
37	2 09.3	2 09.6	2 03.4	37	0.5	97	1.4	157	2.2
38	2 09.5	2 09.9	2 03.6	38	0.5	98	1.4	158	2.2
39	2 09.8	2 10.1	2 03.8	39	0.6	99	1.4	159	2.3
40	2 10.0	2 10.4	2 04.1	40	0.6	100	1.4	160	2.3
41	2 10.3	2 10.6	2 04.3	41	0.6	101	1.4	161	2.3
42	2 10.5	2 10.9	2 04.6	42	0.6	102	1.4	162	2.3
43	2 10.8	2 11.1	2 04.8	43	0.6	103	1.5	163	2.3
44	2 11.0	2 11.4	2 05.0	44	0.6	104	1.5	164	2.3
45	2 11.3	2 11.6	2 05.3	45	0.6	105	1.5	165	2.3
46	2 11.5	2 11.9	2 05.5	46	0.7	106	1.5	166	2.4
47	2 11.8	2 12.1	2 05.7	47	0.7	107	1.5	167	2.4
48	2 12.0	2 12.4	2 06.0	48	0.7	108	1.5	168	2.4
49	2 12.3	2 12.6	2 06.2	49	0.7	109	1.5	169	2.4
50	2 12.5	2 12.9	2 06.5	50	0.7	110	1.6	170	2.4
51	2 12.8	2 13.1	2 06.7	51	0.7	111	1.6	171	2.4
52	2 13.0	2 13.4	2 06.9	52	0.7	112	1.6	172	2.4
53	2 13.3	2 13.6	2 07.2	53	0.8	113	1.6	173	2.5
54	2 13.5	2 13.9	2 07.4	54	0.8	114	1.6	174	2.5
55	2 13.8	2 14.1	2 07.7	55	0.8	115	1.6	175	2.5
56	2 14.0	2 14.4	2 07.9	56	0.8	116	1.6	176	2.5
57	2 14.3	2 14.6	2 08.1	57	0.8	117	1.7	177	2.5
58	2 14.5	2 14.9	2 08.4	58	0.8	118	1.7	178	2.5
59	2 14.8	2 15.1	2 08.6	59	0.8	119	1.7	179	2.5
60	2 15.0	2 15.4	2 08.9	60	0.9	120	1.7	180	2.6

9^m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	2 15.0	2 15.4	2 08.9	0	0.0	60	1.0	120	1.9
1	2 15.3	2 15.6	2 09.1	1	0.0	61	1.0	121	1.9
2	2 15.5	2 15.9	2 09.3	2	0.0	62	1.0	122	1.9
3	2 15.8	2 16.1	2 09.6	3	0.0	63	1.0	123	1.9
4	2 16.0	2 16.4	2 09.8	4	0.1	64	1.0	124	2.0
5	2 16.3	2 16.6	2 10.0	5	0.1	65	1.0	125	2.0
6	2 16.5	2 16.9	2 10.3	6	0.1	66	1.0	126	2.0
7	2 16.8	2 17.1	2 10.5	7	0.1	67	1.1	127	2.0
8	2 17.0	2 17.4	2 10.8	8	0.1	68	1.1	128	2.0
9	2 17.3	2 17.6	2 11.0	9	0.1	69	1.1	129	2.0
10	2 17.5	2 17.9	2 11.2	10	0.2	70	1.1	130	2.1
11	2 17.8	2 18.1	2 11.5	11	0.2	71	1.1	131	2.1
12	2 18.0	2 18.4	2 11.7	12	0.2	72	1.1	132	2.1
13	2 18.3	2 18.6	2 12.0	13	0.2	73	1.2	133	2.1
14	2 18.5	2 18.9	2 12.2	14	0.2	74	1.2	134	2.1
15	2 18.8	2 19.1	2 12.4	15	0.2	75	1.2	135	2.1
16	2 19.0	2 19.4	2 12.7	16	0.3	76	1.2	136	2.2
17	2 19.3	2 19.6	2 12.9	17	0.3	77	1.2	137	2.2
18	2 19.5	2 19.9	2 13.1	18	0.3	78	1.2	138	2.2
19	2 19.8	2 20.1	2 13.4	19	0.3	79	1.3	139	2.2
20	2 20.0	2 20.4	2 13.6	20	0.3	80	1.3	140	2.2
21	2 20.3	2 20.6	2 13.9	21	0.3	81	1.3	141	2.2
22	2 20.5	2 20.9	2 14.1	22	0.3	82	1.3	142	2.2
23	2 20.8	2 21.1	2 14.3	23	0.4	83	1.3	143	2.3
24	2 21.0	2 21.4	2 14.6	24	0.4	84	1.3	144	2.3
25	2 21.3	2 21.6	2 14.8	25	0.4	85	1.3	145	2.3
26	2 21.5	2 21.9	2 15.1	26	0.4	86	1.4	146	2.3
27	2 21.8	2 22.1	2 15.3	27	0.4	87	1.4	147	2.3
28	2 22.0	2 22.4	2 15.5	28	0.4	88	1.4	148	2.3
29	2 22.3	2 22.6	2 15.8	29	0.5	89	1.4	149	2.4
30	2 22.5	2 22.9	2 16.0	30	0.5	90	1.4	150	2.4
31	2 22.8	2 23.1	2 16.2	31	0.5	91	1.4	151	2.4
32	2 23.0	2 23.4	2 16.5	32	0.5	92	1.5	152	2.4
33	2 23.3	2 23.6	2 16.7	33	0.5	93	1.5	153	2.4
34	2 23.5	2 23.9	2 17.0	34	0.5	94	1.5	154	2.4
35	2 23.8	2 24.1	2 17.2	35	0.6	95	1.5	155	2.5
36	2 24.0	2 24.4	2 17.4	36	0.6	96	1.5	156	2.5
37	2 24.3	2 24.6	2 17.7	37	0.6	97	1.5	157	2.5
38	2 24.5	2 24.9	2 17.9	38	0.6	98	1.6	158	2.5
39	2 24.8	2 25.1	2 18.2	39	0.6	99	1.6	159	2.5
40	2 25.0	2 25.4	2 18.4	40	0.6	100	1.6	160	2.5
41	2 25.3	2 25.6	2 18.6	41	0.6	101	1.6	161	2.5
42	2 25.5	2 25.9	2 18.9	42	0.7	102	1.6	162	2.6
43	2 25.8	2 26.1	2 19.1	43	0.7	103	1.6	163	2.6
44	2 26.0	2 26.4	2 19.3	44	0.7	104	1.6	164	2.6
45	2 26.3	2 26.7	2 19.6	45	0.7	105	1.7	165	2.6
46	2 26.5	2 26.9	2 19.8	46	0.7	106	1.7	166	2.6
47	2 26.8	2 27.2	2 20.1	47	0.7	107	1.7	167	2.6
48	2 27.0	2 27.4	2 20.3	48	0.8	108	1.7	168	2.7
49	2 27.3	2 27.7	2 20.5	49	0.8	109	1.7	169	2.7
50	2 27.5	2 27.9	2 20.8	50	0.8	110	1.7	170	2.7
51	2 27.8	2 28.2	2 21.0	51	0.8	111	1.8	171	2.7
52	2 28.0	2 28.4	2 21.3	52	0.8	112	1.8	172	2.7
53	2 28.3	2 28.7	2 21.5	53	0.8	113	1.8	173	2.7
54	2 28.5	2 28.9	2 21.7	54	0.9	114	1.8	174	2.8
55	2 28.8	2 29.2	2 22.0	55	0.9	115	1.8	175	2.8
56	2 29.0	2 29.4	2 22.2	56	0.9	116	1.8	176	2.8
57	2 29.3	2 29.7	2 22.5	57	0.9	117	1.9	177	2.8
58	2 29.5	2 29.9	2 22.7	58	0.9	118	1.9	178	2.8
59	2 29.8	2 30.2	2 22.9	59	0.9	119	1.9	179	2.8
60	2 30.0	2 30.4	2 23.2	60	1.0	120	1.9	180	2.9

10m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	2 30.0	2 30.4	2 23.2	0	0.0	60	1.1	120	2.1
1	2 30.3	2 30.7	2 23.4	1	0.0	61	1.1	121	2.1
2	2 30.5	2 30.9	2 23.6	2	0.0	62	1.1	122	2.1
3	2 30.8	2 31.2	2 23.9	3	0.1	63	1.1	123	2.2
4	2 31.0	2 31.4	2 24.1	4	0.1	64	1.1	124	2.2
5	2 31.3	2 31.7	2 24.4	5	0.1	65	1.1	125	2.2
6	2 31.5	2 31.9	2 24.6	6	0.1	66	1.2	126	2.2
7	2 31.8	2 32.2	2 24.8	7	0.1	67	1.2	127	2.2
8	2 32.0	2 32.4	2 25.1	8	0.1	68	1.2	128	2.2
9	2 32.3	2 32.7	2 25.3	9	0.2	69	1.2	129	2.3
10	2 32.5	2 32.9	2 25.6	10	0.2	70	1.2	130	2.3
11	2 32.8	2 33.2	2 25.8	11	0.2	71	1.2	131	2.3
12	2 33.0	2 33.4	2 26.0	12	0.2	72	1.3	132	2.3
13	2 33.3	2 33.7	2 26.3	13	0.2	73	1.3	133	2.3
14	2 33.5	2 33.9	2 26.5	14	0.2	74	1.3	134	2.3
15	2 33.8	2 34.2	2 26.7	15	0.3	75	1.3	135	2.4
16	2 34.0	2 34.4	2 27.0	16	0.3	76	1.3	136	2.4
17	2 34.3	2 34.7	2 27.2	17	0.3	77	1.3	137	2.4
18	2 34.5	2 34.9	2 27.5	18	0.3	78	1.4	138	2.4
19	2 34.8	2 35.2	2 27.7	19	0.3	79	1.4	139	2.4
20	2 35.0	2 35.4	2 27.9	20	0.4	80	1.4	140	2.5
21	2 35.3	2 35.7	2 28.2	21	0.4	81	1.4	141	2.5
22	2 35.5	2 35.9	2 28.4	22	0.4	82	1.4	142	2.5
23	2 35.8	2 36.2	2 28.7	23	0.4	83	1.5	143	2.5
24	2 36.0	2 36.4	2 28.9	24	0.4	84	1.5	144	2.5
25	2 36.3	2 36.7	2 29.1	25	0.4	85	1.5	145	2.5
26	2 36.5	2 36.9	2 29.4	26	0.5	86	1.5	146	2.6
27	2 36.8	2 37.2	2 29.6	27	0.5	87	1.5	147	2.6
28	2 37.0	2 37.4	2 29.8	28	0.5	88	1.5	148	2.6
29	2 37.3	2 37.7	2 30.1	29	0.5	89	1.6	149	2.6
30	2 37.5	2 37.9	2 30.3	30	0.5	90	1.6	150	2.6
31	2 37.8	2 38.2	2 30.6	31	0.5	91	1.6	151	2.6
32	2 38.0	2 38.4	2 30.8	32	0.6	92	1.6	152	2.7
33	2 38.3	2 38.7	2 31.0	33	0.6	93	1.6	153	2.7
34	2 38.5	2 38.9	2 31.3	34	0.6	94	1.6	154	2.7
35	2 38.8	2 39.2	2 31.5	35	0.6	95	1.7	155	2.7
36	2 39.0	2 39.4	2 31.8	36	0.6	96	1.7	156	2.7
37	2 39.3	2 39.7	2 32.0	37	0.6	97	1.7	157	2.7
38	2 39.5	2 39.9	2 32.2	38	0.7	98	1.7	158	2.8
39	2 39.8	2 40.2	2 32.5	39	0.7	99	1.7	159	2.8
40	2 40.0	2 40.4	2 32.7	40	0.7	100	1.8	160	2.8
41	2 40.3	2 40.7	2 32.9	41	0.7	101	1.8	161	2.8
42	2 40.5	2 40.9	2 33.2	42	0.7	102	1.8	162	2.8
43	2 40.8	2 41.2	2 33.4	43	0.8	103	1.8	163	2.9
44	2 41.0	2 41.4	2 33.7	44	0.8	104	1.8	164	2.9
45	2 41.3	2 41.7	2 33.9	45	0.8	105	1.8	165	2.9
46	2 41.5	2 41.9	2 34.1	46	0.8	106	1.9	166	2.9
47	2 41.8	2 42.2	2 34.4	47	0.8	107	1.9	167	2.9
48	2 42.0	2 42.4	2 34.6	48	0.8	108	1.9	168	2.9
49	2 42.3	2 42.7	2 34.9	49	0.9	109	1.9	169	3.0
50	2 42.5	2 42.9	2 35.1	50	0.9	110	1.9	170	3.0
51	2 42.8	2 43.2	2 35.3	51	0.9	111	1.9	171	3.0
52	2 43.0	2 43.4	2 35.6	52	0.9	112	2.0	172	3.0
53	2 43.3	2 43.7	2 35.8	53	0.9	113	2.0	173	3.0
54	2 43.5	2 43.9	2 36.1	54	0.9	114	2.0	174	3.0
55	2 43.8	2 44.2	2 36.3	55	1.0	115	2.0	175	3.1
56	2 44.0	2 44.4	2 36.5	56	1.0	116	2.0	176	3.1
57	2 44.3	2 44.7	2 36.8	57	1.0	117	2.0	177	3.1
58	2 44.5	2 45.0	2 37.0	58	1.0	118	2.1	178	3.1
59	2 44.8	2 45.2	2 37.2	59	1.0	119	2.1	179	3.1
60	2 45.0	2 45.5	2 37.5	60	1.1	120	2.1	180	3.2

11m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	2 45.0	2 45.5	2 37.5	0	0.0	60	1.2	120	2.3
1	2 45.3	2 45.7	2 37.7	1	0.0	61	1.2	121	2.3
2	2 45.5	2 46.0	2 38.0	2	0.0	62	1.2	122	2.3
3	2 45.8	2 46.2	2 38.2	3	0.1	63	1.2	123	2.4
4	2 46.0	2 46.5	2 38.4	4	0.1	64	1.2	124	2.4
5	2 46.3	2 46.7	2 38.7	5	0.1	65	1.2	125	2.4
6	2 46.5	2 47.0	2 38.9	6	0.1	66	1.3	126	2.4
7	2 46.8	2 47.2	2 39.2	7	0.1	67	1.3	127	2.4
8	2 47.0	2 47.5	2 39.4	8	0.2	68	1.3	128	2.5
9	2 47.3	2 47.7	2 39.6	9	0.2	69	1.3	129	2.5
10	2 47.5	2 48.0	2 39.9	10	0.2	70	1.3	130	2.5
11	2 47.8	2 48.2	2 40.1	11	0.2	71	1.4	131	2.5
12	2 48.0	2 48.5	2 40.3	12	0.2	72	1.4	132	2.5
13	2 48.3	2 48.7	2 40.6	13	0.2	73	1.4	133	2.5
14	2 48.5	2 49.0	2 40.8	14	0.3	74	1.4	134	2.6
15	2 48.8	2 49.2	2 41.1	15	0.3	75	1.4	135	2.6
16	2 49.0	2 49.5	2 41.3	16	0.3	76	1.5	136	2.6
17	2 49.3	2 49.7	2 41.5	17	0.3	77	1.5	137	2.6
18	2 49.5	2 50.0	2 41.8	18	0.3	78	1.5	138	2.6
19	2 49.8	2 50.2	2 42.0	19	0.4	79	1.5	139	2.7
20	2 50.0	2 50.5	2 42.3	20	0.4	80	1.5	140	2.7
21	2 50.3	2 50.7	2 42.5	21	0.4	81	1.6	141	2.7
22	2 50.5	2 51.0	2 42.7	22	0.4	82	1.6	142	2.7
23	2 50.8	2 51.2	2 43.0	23	0.4	83	1.6	143	2.7
24	2 51.0	2 51.5	2 43.2	24	0.5	84	1.6	144	2.8
25	2 51.3	2 51.7	2 43.4	25	0.5	85	1.6	145	2.8
26	2 51.5	2 52.0	2 43.7	26	0.5	86	1.6	146	2.8
27	2 51.8	2 52.2	2 43.9	27	0.5	87	1.7	147	2.8
28	2 52.0	2 52.5	2 44.2	28	0.5	88	1.7	148	2.8
29	2 52.3	2 52.7	2 44.4	29	0.6	89	1.7	149	2.9
30	2 52.5	2 53.0	2 44.6	30	0.6	90	1.7	150	2.9
31	2 52.8	2 53.2	2 44.9	31	0.6	91	1.7	151	2.9
32	2 53.0	2 53.5	2 45.1	32	0.6	92	1.8	152	2.9
33	2 53.3	2 53.7	2 45.4	33	0.6	93	1.8	153	2.9
34	2 53.5	2 54.0	2 45.6	34	0.7	94	1.8	154	3.0
35	2 53.8	2 54.2	2 45.8	35	0.7	95	1.8	155	3.0
36	2 54.0	2 54.5	2 46.1	36	0.7	96	1.8	156	3.0
37	2 54.3	2 54.7	2 46.3	37	0.7	97	1.9	157	3.0
38	2 54.5	2 55.0	2 46.6	38	0.7	98	1.9	158	3.0
39	2 54.8	2 55.2	2 46.8	39	0.7	99	1.9	159	3.0
40	2 55.0	2 55.5	2 47.0	40	0.8	100	1.9	160	3.1
41	2 55.3	2 55.7	2 47.3	41	0.8	101	1.9	161	3.1
42	2 55.5	2 56.0	2 47.5	42	0.8	102	2.0	162	3.1
43	2 55.8	2 56.2	2 47.7	43	0.8	103	2.0	163	3.1
44	2 56.0	2 56.5	2 48.0	44	0.8	104	2.0	164	3.1
45	2 56.3	2 56.7	2 48.2	45	0.9	105	2.0	165	3.2
46	2 56.5	2 57.0	2 48.5	46	0.9	106	2.0	166	3.2
47	2 56.8	2 57.2	2 48.7	47	0.9	107	2.1	167	3.2
48	2 57.0	2 57.5	2 48.9	48	0.9	108	2.1	168	3.2
49	2 57.3	2 57.7	2 49.2	49	0.9	109	2.1	169	3.2
50	2 57.5	2 58.0	2 49.4	50	1.0	110	2.1	170	3.3
51	2 57.8	2 58.2	2 49.7	51	1.0	111	2.1	171	3.3
52	2 58.0	2 58.5	2 49.9	52	1.0	112	2.1	172	3.3
53	2 58.3	2 58.7	2 50.1	53	1.0	113	2.2	173	3.3
54	2 58.5	2 59.0	2 50.4	54	1.0	114	2.2	174	3.3
55	2 58.8	2 59.2	2 50.6	55	1.1	115	2.2	175	3.4
56	2 59.0	2 59.5	2 50.8	56	1.1	116	2.2	176	3.4
57	2 59.3	2 59.7	2 51.1	57	1.1	117	2.2	177	3.4
58	2 59.5	3 00.0	2 51.3	58	1.1	118	2.3	178	3.4
59	2 59.8	3 00.2	2 51.6	59	1.1	119	2.3	179	3.4
60	3 00.0	3 00.5	2 51.8	60	1.2	120	2.3	180	3.5

12ᵐ

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	3 00.0	3 00.5	2 51.8	0	0.0	60	1.3	120	2.5
1	3 00.3	3 00.7	2 52.0	1	0.0	61	1.3	121	2.5
2	3 00.5	3 01.0	2 52.3	2	0.0	62	1.3	122	2.5
3	3 00.8	3 01.2	2 52.5	3	0.1	63	1.3	123	2.6
4	3 01.0	3 01.5	2 52.8	4	0.1	64	1.3	124	2.6
5	3 01.3	3 01.7	2 53.0	5	0.1	65	1.4	125	2.6
6	3 01.5	3 02.0	2 53.2	6	0.1	66	1.4	126	2.6
7	3 01.8	3 02.2	2 53.5	7	0.1	67	1.4	127	2.6
8	3 02.0	3 02.5	2 53.7	8	0.2	68	1.4	128	2.7
9	3 02.3	3 02.7	2 53.9	9	0.2	69	1.4	129	2.7
10	3 02.5	3 03.0	2 54.2	10	0.2	70	1.5	130	2.7
11	3 02.8	3 03.3	2 54.4	11	0.2	71	1.5	131	2.7
12	3 03.0	3 03.5	2 54.7	12	0.3	72	1.5	132	2.8
13	3 03.3	3 03.8	2 54.9	13	0.3	73	1.5	133	2.8
14	3 03.5	3 04.0	2 55.1	14	0.3	74	1.5	134	2.8
15	3 03.8	3 04.3	2 55.4	15	0.3	75	1.6	135	2.8
16	3 04.0	3 04.5	2 55.6	16	0.3	76	1.6	136	2.8
17	3 04.3	3 04.8	2 55.9	17	0.4	77	1.6	137	2.9
18	3 04.5	3 05.0	2 56.1	18	0.4	78	1.6	138	2.9
19	3 04.8	3 05.3	2 56.3	19	0.4	79	1.6	139	2.9
20	3 05.0	3 05.5	2 56.6	20	0.4	80	1.7	140	2.9
21	3 05.3	3 05.8	2 56.8	21	0.4	81	1.7	141	2.9
22	3 05.5	3 06.0	2 57.0	22	0.5	82	1.7	142	3.0
23	3 05.8	3 06.3	2 57.3	23	0.5	83	1.7	143	3.0
24	3 06.0	3 06.5	2 57.5	24	0.5	84	1.8	144	3.0
25	3 06.3	3 06.8	2 57.8	25	0.5	85	1.8	145	3.0
26	3 06.5	3 07.0	2 58.0	26	0.5	86	1.8	146	3.0
27	3 06.8	3 07.3	2 58.2	27	0.6	87	1.8	147	3.1
28	3 07.0	3 07.5	2 58.5	28	0.6	88	1.8	148	3.1
29	3 07.3	3 07.8	2 58.7	29	0.6	89	1.9	149	3.1
30	3 07.5	3 08.0	2 59.0	30	0.6	90	1.9	150	3.1
31	3 07.8	3 08.3	2 59.2	31	0.6	91	1.9	151	3.1
32	3 08.0	3 08.5	2 59.4	32	0.7	92	1.9	152	3.2
33	3 08.3	3 08.8	2 59.7	33	0.7	93	1.9	153	3.2
34	3 08.5	3 09.0	2 59.9	34	0.7	94	2.0	154	3.2
35	3 08.8	3 09.3	3 00.2	35	0.7	95	2.0	155	3.2
36	3 09.0	3 09.5	3 00.4	36	0.8	96	2.0	156	3.3
37	3 09.3	3 09.8	3 00.6	37	0.8	97	2.0	157	3.3
38	3 09.5	3 10.0	3 00.9	38	0.8	98	2.0	158	3.3
39	3 09.8	3 10.3	3 01.1	39	0.8	99	2.1	159	3.3
40	3 10.0	3 10.5	3 01.3	40	0.8	100	2.1	160	3.3
41	3 10.3	3 10.8	3 01.6	41	0.9	101	2.1	161	3.4
42	3 10.5	3 11.0	3 01.8	42	0.9	102	2.1	162	3.4
43	3 10.8	3 11.3	3 02.1	43	0.9	103	2.1	163	3.4
44	3 11.0	3 11.5	3 02.3	44	0.9	104	2.2	164	3.4
45	3 11.3	3 11.8	3 02.5	45	0.9	105	2.2	165	3.4
46	3 11.5	3 12.0	3 02.8	46	1.0	106	2.2	166	3.5
47	3 11.8	3 12.3	3 03.0	47	1.0	107	2.2	167	3.5
48	3 12.0	3 12.5	3 03.3	48	1.0	108	2.3	168	3.5
49	3 12.3	3 12.8	3 03.5	49	1.0	109	2.3	169	3.5
50	3 12.5	3 13.0	3 03.7	50	1.0	110	2.3	170	3.5
51	3 12.8	3 13.3	3 04.0	51	1.1	111	2.3	171	3.6
52	3 13.0	3 13.5	3 04.2	52	1.1	112	2.3	172	3.6
53	3 13.3	3 13.8	3 04.4	53	1.1	113	2.4	173	3.6
54	3 13.5	3 14.0	3 04.7	54	1.1	114	2.4	174	3.6
55	3 13.8	3 14.3	3 04.9	55	1.1	115	2.4	175	3.6
56	3 14.0	3 14.5	3 05.2	56	1.2	116	2.4	176	3.7
57	3 14.3	3 14.8	3 05.4	57	1.2	117	2.4	177	3.7
58	3 14.5	3 15.0	3 05.6	58	1.2	118	2.5	178	3.7
59	3 14.8	3 15.3	3 05.9	59	1.2	119	2.5	179	3.7
60	3 15.0	3 15.5	3 06.1	60	1.3	120	2.5	180	3.8

13ᵐ

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	3 15.0	3 15.5	3 06.1	0	0.0	60	1.4	120	2.7
1	3 15.3	3 15.8	3 06.4	1	0.0	61	1.4	121	2.7
2	3 15.5	3 16.0	3 06.6	2	0.0	62	1.4	122	2.7
3	3 15.8	3 16.3	3 06.8	3	0.1	63	1.4	123	2.8
4	3 16.0	3 16.5	3 07.1	4	0.1	64	1.4	124	2.8
5	3 16.3	3 16.8	3 07.3	5	0.1	65	1.5	125	2.8
6	3 16.5	3 17.0	3 07.5	6	0.1	66	1.5	126	2.8
7	3 16.8	3 17.3	3 07.8	7	0.2	67	1.5	127	2.9
8	3 17.0	3 17.5	3 08.0	8	0.2	68	1.5	128	2.9
9	3 17.3	3 17.8	3 08.3	9	0.2	69	1.6	129	2.9
10	3 17.5	3 18.0	3 08.5	10	0.2	70	1.6	130	2.9
11	3 17.8	3 18.3	3 08.7	11	0.2	71	1.6	131	2.9
12	3 18.0	3 18.5	3 09.0	12	0.3	72	1.6	132	3.0
13	3 18.3	3 18.8	3 09.2	13	0.3	73	1.6	133	3.0
14	3 18.5	3 19.0	3 09.5	14	0.3	74	1.7	134	3.0
15	3 18.8	3 19.3	3 09.7	15	0.3	75	1.7	135	3.0
16	3 19.0	3 19.5	3 09.9	16	0.4	76	1.7	136	3.1
17	3 19.3	3 19.8	3 10.2	17	0.4	77	1.7	137	3.1
18	3 19.5	3 20.0	3 10.4	18	0.4	78	1.8	138	3.1
19	3 19.8	3 20.3	3 10.7	19	0.4	79	1.8	139	3.1
20	3 20.0	3 20.5	3 10.9	20	0.5	80	1.8	140	3.2
21	3 20.3	3 20.8	3 11.1	21	0.5	81	1.8	141	3.2
22	3 20.5	3 21.0	3 11.4	22	0.5	82	1.8	142	3.2
23	3 20.8	3 21.3	3 11.6	23	0.5	83	1.9	143	3.2
24	3 21.0	3 21.6	3 11.8	24	0.5	84	1.9	144	3.2
25	3 21.3	3 21.8	3 12.1	25	0.6	85	1.9	145	3.3
26	3 21.5	3 22.1	3 12.3	26	0.6	86	1.9	146	3.3
27	3 21.8	3 22.3	3 12.6	27	0.6	87	2.0	147	3.3
28	3 22.0	3 22.6	3 12.8	28	0.6	88	2.0	148	3.3
29	3 22.3	3 22.8	3 13.0	29	0.7	89	2.0	149	3.4
30	3 22.5	3 23.1	3 13.3	30	0.7	90	2.0	150	3.4
31	3 22.8	3 23.3	3 13.5	31	0.7	91	2.0	151	3.4
32	3 23.0	3 23.6	3 13.8	32	0.7	92	2.1	152	3.4
33	3 23.3	3 23.8	3 14.0	33	0.7	93	2.1	153	3.4
34	3 23.5	3 24.1	3 14.2	34	0.8	94	2.1	154	3.5
35	3 23.8	3 24.3	3 14.5	35	0.8	95	2.1	155	3.5
36	3 24.0	3 24.6	3 14.7	36	0.8	96	2.2	156	3.5
37	3 24.3	3 24.8	3 14.9	37	0.8	97	2.2	157	3.5
38	3 24.5	3 25.1	3 15.2	38	0.9	98	2.2	158	3.6
39	3 24.8	3 25.3	3 15.4	39	0.9	99	2.2	159	3.6
40	3 25.0	3 25.6	3 15.7	40	0.9	100	2.3	160	3.6
41	3 25.3	3 25.8	3 15.9	41	0.9	101	2.3	161	3.6
42	3 25.5	3 26.1	3 16.1	42	0.9	102	2.3	162	3.6
43	3 25.8	3 26.3	3 16.4	43	1.0	103	2.3	163	3.7
44	3 26.0	3 26.6	3 16.6	44	1.0	104	2.3	164	3.7
45	3 26.3	3 26.8	3 16.9	45	1.0	105	2.4	165	3.7
46	3 26.5	3 27.1	3 17.1	46	1.0	106	2.4	166	3.7
47	3 26.8	3 27.3	3 17.3	47	1.1	107	2.4	167	3.8
48	3 27.0	3 27.6	3 17.6	48	1.1	108	2.4	168	3.8
49	3 27.3	3 27.8	3 17.8	49	1.1	109	2.5	169	3.8
50	3 27.5	3 28.1	3 18.0	50	1.1	110	2.5	170	3.8
51	3 27.8	3 28.3	3 18.3	51	1.1	111	2.5	171	3.8
52	3 28.0	3 28.6	3 18.5	52	1.2	112	2.5	172	3.9
53	3 28.3	3 28.8	3 18.8	53	1.2	113	2.5	173	3.9
54	3 28.5	3 29.1	3 19.0	54	1.2	114	2.6	174	3.9
55	3 28.8	3 29.3	3 19.2	55	1.2	115	2.6	175	3.9
56	3 29.0	3 29.6	3 19.5	56	1.3	116	2.6	176	4.0
57	3 29.3	3 29.8	3 19.7	57	1.3	117	2.6	177	4.0
58	3 29.5	3 30.1	3 20.0	58	1.3	118	2.7	178	4.0
59	3 29.8	3 30.3	3 20.2	59	1.3	119	2.7	179	4.0
60	3 30.0	3 30.6	3 20.4	60	1.4	120	2.7	180	4.1

14m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	3 30.0	3 30.6	3 20.4	0	0.0	60	1.5	120	2.9
1	3 30.3	3 30.8	3 20.7	1	0.0	61	1.5	121	2.9
2	3 30.5	3 31.1	3 20.9	2	0.0	62	1.5	122	2.9
3	3 30.8	3 31.3	3 21.1	3	0.1	63	1.5	123	3.0
4	3 31.0	3 31.6	3 21.4	4	0.1	64	1.5	124	3.0
5	3 31.3	3 31.8	3 21.6	5	0.1	65	1.6	125	3.0
6	3 31.5	3 32.1	3 21.9	6	0.1	66	1.6	126	3.0
7	3 31.8	3 32.3	3 22.1	7	0.2	67	1.6	127	3.1
8	3 32.0	3 32.6	3 22.3	8	0.2	68	1.6	128	3.1
9	3 32.3	3 32.8	3 22.6	9	0.2	69	1.7	129	3.1
10	3 32.5	3 33.1	3 22.8	10	0.2	70	1.7	130	3.1
11	3 32.8	3 33.3	3 23.1	11	0.3	71	1.7	131	3.2
12	3 33.0	3 33.6	3 23.3	12	0.3	72	1.7	132	3.2
13	3 33.3	3 33.8	3 23.5	13	0.3	73	1.8	133	3.2
14	3 33.5	3 34.1	3 23.8	14	0.3	74	1.8	134	3.2
15	3 33.8	3 34.3	3 24.0	15	0.4	75	1.8	135	3.3
16	3 34.0	3 34.6	3 24.3	16	0.4	76	1.8	136	3.3
17	3 34.3	3 34.8	3 24.5	17	0.4	77	1.9	137	3.3
18	3 34.5	3 35.1	3 24.7	18	0.4	78	1.9	138	3.3
19	3 34.8	3 35.3	3 25.0	19	0.5	79	1.9	139	3.4
20	3 35.0	3 35.6	3 25.2	20	0.5	80	1.9	140	3.4
21	3 35.3	3 35.8	3 25.4	21	0.5	81	2.0	141	3.4
22	3 35.5	3 36.1	3 25.7	22	0.5	82	2.0	142	3.4
23	3 35.8	3 36.3	3 25.9	23	0.6	83	2.0	143	3.5
24	3 36.0	3 36.6	3 26.2	24	0.6	84	2.0	144	3.5
25	3 36.3	3 36.8	3 26.4	25	0.6	85	2.1	145	3.5
26	3 36.5	3 37.1	3 26.6	26	0.6	86	2.1	146	3.5
27	3 36.8	3 37.3	3 26.9	27	0.7	87	2.1	147	3.6
28	3 37.0	3 37.6	3 27.1	28	0.7	88	2.1	148	3.6
29	3 37.3	3 37.8	3 27.4	29	0.7	89	2.2	149	3.6
30	3 37.5	3 38.1	3 27.6	30	0.7	90	2.2	150	3.6
31	3 37.8	3 38.3	3 27.8	31	0.7	91	2.2	151	3.6
32	3 38.0	3 38.6	3 28.1	32	0.8	92	2.2	152	3.7
33	3 38.3	3 38.8	3 28.3	33	0.8	93	2.2	153	3.7
34	3 38.5	3 39.1	3 28.5	34	0.8	94	2.3	154	3.7
35	3 38.8	3 39.3	3 28.8	35	0.8	95	2.3	155	3.7
36	3 39.0	3 39.6	3 29.0	36	0.9	96	2.3	156	3.8
37	3 39.3	3 39.9	3 29.3	37	0.9	97	2.3	157	3.8
38	3 39.5	3 40.1	3 29.5	38	0.9	98	2.4	158	3.8
39	3 39.8	3 40.4	3 29.7	39	0.9	99	2.4	159	3.8
40	3 40.0	3 40.6	3 30.0	40	1.0	100	2.4	160	3.9
41	3 40.3	3 40.9	3 30.2	41	1.0	101	2.4	161	3.9
42	3 40.5	3 41.1	3 30.5	42	1.0	102	2.5	162	3.9
43	3 40.8	3 41.4	3 30.7	43	1.0	103	2.5	163	3.9
44	3 41.0	3 41.6	3 30.9	44	1.1	104	2.5	164	4.0
45	3 41.3	3 41.9	3 31.2	45	1.1	105	2.5	165	4.0
46	3 41.5	3 42.1	3 31.4	46	1.1	106	2.6	166	4.0
47	3 41.8	3 42.4	3 31.6	47	1.1	107	2.6	167	4.0
48	3 42.0	3 42.6	3 31.9	48	1.2	108	2.6	168	4.1
49	3 42.3	3 42.9	3 32.1	49	1.2	109	2.6	169	4.1
50	3 42.5	3 43.1	3 32.4	50	1.2	110	2.7	170	4.1
51	3 42.8	3 43.4	3 32.6	51	1.2	111	2.7	171	4.1
52	3 43.0	3 43.6	3 32.8	52	1.3	112	2.7	172	4.2
53	3 43.3	3 43.9	3 33.1	53	1.3	113	2.7	173	4.2
54	3 43.5	3 44.1	3 33.3	54	1.3	114	2.8	174	4.2
55	3 43.8	3 44.4	3 33.6	55	1.3	115	2.8	175	4.2
56	3 44.0	3 44.6	3 33.8	56	1.4	116	2.8	176	4.3
57	3 44.3	3 44.9	3 34.0	57	1.4	117	2.8	177	4.3
58	3 44.5	3 45.1	3 34.3	58	1.4	118	2.9	178	4.3
59	3 44.8	3 45.4	3 34.5	59	1.4	119	2.9	179	4.3
60	3 45.0	3 45.6	3 34.8	60	1.5	120	2.9	180	4.4

15m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	3 45.0	3 45.6	3 34.8	0	0.0	60	1.6	120	3.1
1	3 45.3	3 45.9	3 35.0	1	0.0	61	1.6	121	3.1
2	3 45.5	3 46.1	3 35.2	2	0.1	62	1.6	122	3.2
3	3 45.8	3 46.4	3 35.5	3	0.1	63	1.6	123	3.2
4	3 46.0	3 46.6	3 35.7	4	0.1	64	1.7	124	3.2
5	3 46.3	3 46.9	3 35.9	5	0.1	65	1.7	125	3.2
6	3 46.5	3 47.1	3 36.2	6	0.2	66	1.7	126	3.3
7	3 46.8	3 47.4	3 36.4	7	0.2	67	1.7	127	3.3
8	3 47.0	3 47.6	3 36.7	8	0.2	68	1.8	128	3.3
9	3 47.3	3 47.9	3 36.9	9	0.2	69	1.8	129	3.3
10	3 47.5	3 48.1	3 37.1	10	0.3	70	1.8	130	3.4
11	3 47.8	3 48.4	3 37.4	11	0.3	71	1.8	131	3.4
12	3 48.0	3 48.6	3 37.6	12	0.3	72	1.9	132	3.4
13	3 48.3	3 48.9	3 37.9	13	0.3	73	1.9	133	3.4
14	3 48.5	3 49.1	3 38.1	14	0.4	74	1.9	134	3.5
15	3 48.8	3 49.4	3 38.3	15	0.4	75	1.9	135	3.5
16	3 49.0	3 49.6	3 38.6	16	0.4	76	2.0	136	3.5
17	3 49.3	3 49.9	3 38.8	17	0.4	77	2.0	137	3.5
18	3 49.5	3 50.1	3 39.0	18	0.5	78	2.0	138	3.6
19	3 49.8	3 50.4	3 39.3	19	0.5	79	2.0	139	3.6
20	3 50.0	3 50.6	3 39.5	20	0.5	80	2.1	140	3.6
21	3 50.3	3 50.9	3 39.8	21	0.5	81	2.1	141	3.6
22	3 50.5	3 51.1	3 40.0	22	0.6	82	2.1	142	3.7
23	3 50.8	3 51.4	3 40.2	23	0.6	83	2.1	143	3.7
24	3 51.0	3 51.6	3 40.5	24	0.6	84	2.2	144	3.7
25	3 51.3	3 51.9	3 40.7	25	0.6	85	2.2	145	3.7
26	3 51.5	3 52.1	3 41.0	26	0.7	86	2.2	146	3.8
27	3 51.8	3 52.4	3 41.2	27	0.7	87	2.2	147	3.8
28	3 52.0	3 52.6	3 41.4	28	0.7	88	2.3	148	3.8
29	3 52.3	3 52.9	3 41.7	29	0.7	89	2.3	149	3.8
30	3 52.5	3 53.1	3 41.9	30	0.8	90	2.3	150	3.9
31	3 52.8	3 53.4	3 42.1	31	0.8	91	2.4	151	3.9
32	3 53.0	3 53.6	3 42.4	32	0.8	92	2.4	152	3.9
33	3 53.3	3 53.9	3 42.6	33	0.9	93	2.4	153	4.0
34	3 53.5	3 54.1	3 42.9	34	0.9	94	2.4	154	4.0
35	3 53.8	3 54.4	3 43.1	35	0.9	95	2.5	155	4.0
36	3 54.0	3 54.6	3 43.3	36	0.9	96	2.5	156	4.0
37	3 54.3	3 54.9	3 43.6	37	1.0	97	2.5	157	4.1
38	3 54.5	3 55.1	3 43.8	38	1.0	98	2.5	158	4.1
39	3 54.8	3 55.4	3 44.1	39	1.0	99	2.6	159	4.1
40	3 55.0	3 55.6	3 44.3	40	1.0	100	2.6	160	4.1
41	3 55.3	3 55.9	3 44.5	41	1.1	101	2.6	161	4.2
42	3 55.5	3 56.1	3 44.8	42	1.1	102	2.6	162	4.2
43	3 55.8	3 56.4	3 45.0	43	1.1	103	2.7	163	4.2
44	3 56.0	3 56.6	3 45.2	44	1.1	104	2.7	164	4.2
45	3 56.3	3 56.9	3 45.5	45	1.2	105	2.7	165	4.3
46	3 56.5	3 57.1	3 45.7	46	1.2	106	2.7	166	4.3
47	3 56.8	3 57.4	3 46.0	47	1.2	107	2.8	167	4.3
48	3 57.0	3 57.6	3 46.2	48	1.2	108	2.8	168	4.3
49	3 57.3	3 57.9	3 46.4	49	1.3	109	2.8	169	4.4
50	3 57.5	3 58.2	3 46.7	50	1.3	110	2.8	170	4.4
51	3 57.8	3 58.4	3 46.9	51	1.3	111	2.9	171	4.4
52	3 58.0	3 58.7	3 47.2	52	1.3	112	2.9	172	4.4
53	3 58.3	3 58.9	3 47.4	53	1.4	113	2.9	173	4.5
54	3 58.5	3 59.2	3 47.6	54	1.4	114	2.9	174	4.5
55	3 58.8	3 59.4	3 47.9	55	1.4	115	3.0	175	4.5
56	3 59.0	3 59.7	3 48.1	56	1.4	116	3.0	176	4.5
57	3 59.3	3 59.9	3 48.4	57	1.5	117	3.0	177	4.6
58	3 59.5	4 00.2	3 48.6	58	1.5	118	3.0	178	4.6
59	3 59.8	4 00.4	3 48.8	59	1.5	119	3.1	179	4.6
60	4 00.0	4 00.7	3 49.1	60	1.6	120	3.1	180	4.7

16ᵐ

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	4 00.0	4 00.7	3 49.1	0	0.0	60	1.7	120	3.3
1	4 00.3	4 00.9	3 49.3	1	0.0	61	1.7	121	3.3
2	4 00.5	4 01.2	3 49.5	2	0.1	62	1.7	122	3.4
3	4 00.8	4 01.4	3 49.8	3	0.1	63	1.7	123	3.4
4	4 01.0	4 01.7	3 50.0	4	0.1	64	1.8	124	3.4
5	4 01.3	4 01.9	3 50.3	5	0.1	65	1.8	125	3.4
6	4 01.5	4 02.2	3 50.5	6	0.2	66	1.8	126	3.5
7	4 01.8	4 02.4	3 50.7	7	0.2	67	1.8	127	3.5
8	4 02.0	4 02.7	3 51.0	8	0.2	68	1.9	128	3.5
9	4 02.3	4 02.9	3 51.2	9	0.2	69	1.9	129	3.5
10	4 02.5	4 03.2	3 51.5	10	0.3	70	1.9	130	3.6
11	4 02.8	4 03.4	3 51.7	11	0.3	71	2.0	131	3.6
12	4 03.0	4 03.7	3 51.9	12	0.3	72	2.0	132	3.6
13	4 03.3	4 03.9	3 52.2	13	0.4	73	2.0	133	3.7
14	4 03.5	4 04.2	3 52.4	14	0.4	74	2.0	134	3.7
15	4 03.8	4 04.4	3 52.6	15	0.4	75	2.1	135	3.7
16	4 04.0	4 04.7	3 52.9	16	0.4	76	2.1	136	3.7
17	4 04.3	4 04.9	3 53.1	17	0.5	77	2.1	137	3.8
18	4 04.5	4 05.2	3 53.4	18	0.5	78	2.1	138	3.8
19	4 04.8	4 05.4	3 53.6	19	0.5	79	2.2	139	3.8
20	4 05.0	4 05.7	3 53.8	20	0.6	80	2.2	140	3.9
21	4 05.3	4 05.9	3 54.1	21	0.6	81	2.2	141	3.9
22	4 05.5	4 06.2	3 54.3	22	0.6	82	2.3	142	3.9
23	4 05.8	4 06.4	3 54.6	23	0.6	83	2.3	143	3.9
24	4 06.0	4 06.7	3 54.8	24	0.7	84	2.3	144	4.0
25	4 06.3	4 06.9	3 55.0	25	0.7	85	2.3	145	4.0
26	4 06.5	4 07.2	3 55.3	26	0.7	86	2.4	146	4.0
27	4 06.8	4 07.4	3 55.5	27	0.7	87	2.4	147	4.0
28	4 07.0	4 07.7	3 55.7	28	0.8	88	2.4	148	4.1
29	4 07.3	4 07.9	3 56.0	29	0.8	89	2.4	149	4.1
30	4 07.5	4 08.2	3 56.2	30	0.8	90	2.5	150	4.1
31	4 07.8	4 08.4	3 56.5	31	0.9	91	2.5	151	4.2
32	4 08.0	4 08.7	3 56.7	32	0.9	92	2.5	152	4.2
33	4 08.3	4 08.9	3 56.9	33	0.9	93	2.6	153	4.2
34	4 08.5	4 09.2	3 57.2	34	0.9	94	2.6	154	4.2
35	4 08.8	4 09.4	3 57.4	35	1.0	95	2.6	155	4.3
36	4 09.0	4 09.7	3 57.7	36	1.0	96	2.6	156	4.3
37	4 09.3	4 09.9	3 57.9	37	1.0	97	2.7	157	4.3
38	4 09.5	4 10.2	3 58.1	38	1.0	98	2.7	158	4.3
39	4 09.8	4 10.4	3 58.4	39	1.1	99	2.7	159	4.4
40	4 10.0	4 10.7	3 58.6	40	1.1	100	2.8	160	4.4
41	4 10.3	4 10.9	3 58.8	41	1.1	101	2.8	161	4.4
42	4 10.5	4 11.2	3 59.1	42	1.2	102	2.8	162	4.5
43	4 10.8	4 11.4	3 59.3	43	1.2	103	2.8	163	4.5
44	4 11.0	4 11.7	3 59.6	44	1.2	104	2.9	164	4.5
45	4 11.3	4 11.9	3 59.8	45	1.2	105	2.9	165	4.5
46	4 11.5	4 12.2	4 00.0	46	1.3	106	2.9	166	4.6
47	4 11.8	4 12.4	4 00.3	47	1.3	107	2.9	167	4.6
48	4 12.0	4 12.7	4 00.5	48	1.3	108	3.0	168	4.6
49	4 12.3	4 12.9	4 00.8	49	1.3	109	3.0	169	4.6
50	4 12.5	4 13.2	4 01.0	50	1.4	110	3.0	170	4.7
51	4 12.8	4 13.4	4 01.2	51	1.4	111	3.1	171	4.7
52	4 13.0	4 13.7	4 01.5	52	1.4	112	3.1	172	4.7
53	4 13.3	4 13.9	4 01.7	53	1.5	113	3.1	173	4.8
54	4 13.5	4 14.2	4 02.0	54	1.5	114	3.1	174	4.8
55	4 13.8	4 14.4	4 02.2	55	1.5	115	3.2	175	4.8
56	4 14.0	4 14.7	4 02.4	56	1.5	116	3.2	176	4.8
57	4 14.3	4 14.9	4 02.7	57	1.6	117	3.2	177	4.9
58	4 14.5	4 15.2	4 02.9	58	1.6	118	3.2	178	4.9
59	4 14.8	4 15.4	4 03.1	59	1.6	119	3.3	179	4.9
60	4 15.0	4 15.7	4 03.4	60	1.7	120	3.3	180	5.0

17ᵐ

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	4 15.0	4 15.7	4 03.4	0	0.0	60	1.8	120	3.5
1	4 15.3	4 15.9	4 03.6	1	0.0	61	1.8	121	3.5
2	4 15.5	4 16.2	4 03.9	2	0.1	62	1.8	122	3.6
3	4 15.8	4 16.5	4 04.1	3	0.1	63	1.8	123	3.6
4	4 16.0	4 16.7	4 04.3	4	0.1	64	1.9	124	3.6
5	4 16.3	4 17.0	4 04.6	5	0.1	65	1.9	125	3.6
6	4 16.5	4 17.2	4 04.8	6	0.2	66	1.9	126	3.7
7	4 16.8	4 17.5	4 05.1	7	0.2	67	2.0	127	3.7
8	4 17.0	4 17.7	4 05.3	8	0.2	68	2.0	128	3.7
9	4 17.3	4 18.0	4 05.5	9	0.3	69	2.0	129	3.8
10	4 17.5	4 18.2	4 05.8	10	0.3	70	2.0	130	3.8
11	4 17.8	4 18.5	4 06.0	11	0.3	71	2.1	131	3.8
12	4 18.0	4 18.7	4 06.2	12	0.4	72	2.1	132	3.9
13	4 18.3	4 19.0	4 06.5	13	0.4	73	2.1	133	3.9
14	4 18.5	4 19.2	4 06.7	14	0.4	74	2.2	134	3.9
15	4 18.8	4 19.5	4 07.0	15	0.4	75	2.2	135	3.9
16	4 19.0	4 19.7	4 07.2	16	0.5	76	2.2	136	4.0
17	4 19.3	4 20.0	4 07.4	17	0.5	77	2.2	137	4.0
18	4 19.5	4 20.2	4 07.7	18	0.5	78	2.3	138	4.0
19	4 19.8	4 20.5	4 07.9	19	0.6	79	2.3	139	4.1
20	4 20.0	4 20.7	4 08.2	20	0.6	80	2.3	140	4.1
21	4 20.3	4 21.0	4 08.4	21	0.6	81	2.4	141	4.1
22	4 20.5	4 21.2	4 08.6	22	0.6	82	2.4	142	4.1
23	4 20.8	4 21.5	4 08.9	23	0.7	83	2.4	143	4.2
24	4 21.0	4 21.7	4 09.1	24	0.7	84	2.5	144	4.2
25	4 21.3	4 22.0	4 09.3	25	0.7	85	2.5	145	4.2
26	4 21.5	4 22.2	4 09.6	26	0.8	86	2.5	146	4.3
27	4 21.8	4 22.5	4 09.8	27	0.8	87	2.5	147	4.3
28	4 22.0	4 22.7	4 10.1	28	0.8	88	2.6	148	4.3
29	4 22.3	4 23.0	4 10.3	29	0.8	89	2.6	149	4.3
30	4 22.5	4 23.2	4 10.5	30	0.9	90	2.6	150	4.4
31	4 22.8	4 23.5	4 10.8	31	0.9	91	2.7	151	4.4
32	4 23.0	4 23.7	4 11.0	32	0.9	92	2.7	152	4.4
33	4 23.3	4 24.0	4 11.3	33	1.0	93	2.7	153	4.5
34	4 23.5	4 24.2	4 11.5	34	1.0	94	2.7	154	4.5
35	4 23.8	4 24.5	4 11.7	35	1.0	95	2.8	155	4.5
36	4 24.0	4 24.7	4 12.0	36	1.1	96	2.8	156	4.6
37	4 24.3	4 25.0	4 12.2	37	1.1	97	2.8	157	4.6
38	4 24.5	4 25.2	4 12.5	38	1.1	98	2.9	158	4.6
39	4 24.8	4 25.5	4 12.7	39	1.1	99	2.9	159	4.6
40	4 25.0	4 25.7	4 12.9	40	1.2	100	2.9	160	4.7
41	4 25.3	4 26.0	4 13.2	41	1.2	101	2.9	161	4.7
42	4 25.5	4 26.2	4 13.4	42	1.2	102	3.0	162	4.7
43	4 25.8	4 26.5	4 13.6	43	1.3	103	3.0	163	4.8
44	4 26.0	4 26.7	4 13.9	44	1.3	104	3.0	164	4.8
45	4 26.3	4 27.0	4 14.1	45	1.3	105	3.1	165	4.8
46	4 26.5	4 27.2	4 14.4	46	1.3	106	3.1	166	4.8
47	4 26.8	4 27.5	4 14.6	47	1.4	107	3.1	167	4.9
48	4 27.0	4 27.7	4 14.8	48	1.4	108	3.2	168	4.9
49	4 27.3	4 28.0	4 15.1	49	1.4	109	3.2	169	4.9
50	4 27.5	4 28.2	4 15.3	50	1.5	110	3.2	170	5.0
51	4 27.8	4 28.5	4 15.6	51	1.5	111	3.2	171	5.0
52	4 28.0	4 28.7	4 15.8	52	1.5	112	3.3	172	5.0
53	4 28.3	4 29.0	4 16.0	53	1.5	113	3.3	173	5.0
54	4 28.5	4 29.2	4 16.3	54	1.6	114	3.3	174	5.1
55	4 28.8	4 29.5	4 16.5	55	1.6	115	3.4	175	5.1
56	4 29.0	4 29.7	4 16.7	56	1.6	116	3.4	176	5.1
57	4 29.3	4 30.0	4 17.0	57	1.7	117	3.4	177	5.2
58	4 29.5	4 30.2	4 17.2	58	1.7	118	3.4	178	5.2
59	4 29.8	4 30.5	4 17.5	59	1.7	119	3.5	179	5.2
60	4 30.0	4 30.7	4 17.7	60	1.8	120	3.5	180	5.3

18m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	4 30.0	4 30.7	4 17.7	0	0.0	60	1.9	120	3.7
1	4 30.3	4 31.0	4 17.9	1	0.0	61	1.9	121	3.7
2	4 30.5	4 31.2	4 18.2	2	0.1	62	1.9	122	3.8
3	4 30.8	4 31.5	4 18.4	3	0.1	63	1.9	123	3.8
4	4 31.0	4 31.7	4 18.7	4	0.1	64	2.0	124	3.8
5	4 31.3	4 32.0	4 18.9	5	0.2	65	2.0	125	3.9
6	4 31.5	4 32.2	4 19.1	6	0.2	66	2.0	126	3.9
7	4 31.8	4 32.5	4 19.4	7	0.2	67	2.1	127	3.9
8	4 32.0	4 32.7	4 19.6	8	0.2	68	2.1	128	3.9
9	4 32.3	4 33.0	4 19.8	9	0.3	69	2.1	129	4.0
10	4 32.5	4 33.2	4 20.1	10	0.3	70	2.2	130	4.0
11	4 32.8	4 33.5	4 20.3	11	0.3	71	2.2	131	4.0
12	4 33.0	4 33.7	4 20.6	12	0.4	72	2.2	132	4.1
13	4 33.3	4 34.0	4 20.8	13	0.4	73	2.3	133	4.1
14	4 33.5	4 34.2	4 21.0	14	0.4	74	2.3	134	4.1
15	4 33.8	4 34.5	4 21.3	15	0.5	75	2.3	135	4.2
16	4 34.0	4 34.8	4 21.5	16	0.5	76	2.3	136	4.2
17	4 34.3	4 35.0	4 21.8	17	0.5	77	2.4	137	4.2
18	4 34.5	4 35.3	4 22.0	18	0.6	78	2.4	138	4.3
19	4 34.8	4 35.5	4 22.2	19	0.6	79	2.4	139	4.3
20	4 35.0	4 35.8	4 22.5	20	0.6	80	2.5	140	4.3
21	4 35.3	4 36.0	4 22.7	21	0.6	81	2.5	141	4.3
22	4 35.5	4 36.3	4 22.9	22	0.7	82	2.5	142	4.4
23	4 35.8	4 36.5	4 23.2	23	0.7	83	2.6	143	4.4
24	4 36.0	4 36.8	4 23.4	24	0.7	84	2.6	144	4.4
25	4 36.3	4 37.0	4 23.7	25	0.8	85	2.6	145	4.5
26	4 36.5	4 37.3	4 23.9	26	0.8	86	2.7	146	4.5
27	4 36.8	4 37.5	4 24.1	27	0.8	87	2.7	147	4.5
28	4 37.0	4 37.8	4 24.4	28	0.9	88	2.7	148	4.6
29	4 37.3	4 38.0	4 24.6	29	0.9	89	2.7	149	4.6
30	4 37.5	4 38.3	4 24.9	30	0.9	90	2.8	150	4.6
31	4 37.8	4 38.5	4 25.1	31	1.0	91	2.8	151	4.7
32	4 38.0	4 38.8	4 25.3	32	1.0	92	2.8	152	4.7
33	4 38.3	4 39.0	4 25.6	33	1.0	93	2.9	153	4.7
34	4 38.5	4 39.3	4 25.8	34	1.0	94	2.9	154	4.7
35	4 38.8	4 39.5	4 26.1	35	1.1	95	2.9	155	4.8
36	4 39.0	4 39.8	4 26.3	36	1.1	96	3.0	156	4.8
37	4 39.3	4 40.0	4 26.5	37	1.1	97	3.0	157	4.8
38	4 39.5	4 40.3	4 26.8	38	1.2	98	3.0	158	4.9
39	4 39.8	4 40.5	4 27.0	39	1.2	99	3.1	159	4.9
40	4 40.0	4 40.8	4 27.2	40	1.2	100	3.1	160	4.9
41	4 40.3	4 41.0	4 27.5	41	1.3	101	3.1	161	5.0
42	4 40.5	4 41.3	4 27.7	42	1.3	102	3.1	162	5.0
43	4 40.8	4 41.5	4 28.0	43	1.3	103	3.2	163	5.0
44	4 41.0	4 41.8	4 28.2	44	1.4	104	3.2	164	5.1
45	4 41.3	4 42.0	4 28.4	45	1.4	105	3.2	165	5.1
46	4 41.5	4 42.3	4 28.7	46	1.4	106	3.3	166	5.1
47	4 41.8	4 42.5	4 28.9	47	1.4	107	3.3	167	5.1
48	4 42.0	4 42.8	4 29.2	48	1.5	108	3.3	168	5.2
49	4 42.3	4 43.0	4 29.4	49	1.5	109	3.4	169	5.2
50	4 42.5	4 43.3	4 29.6	50	1.5	110	3.4	170	5.2
51	4 42.8	4 43.5	4 29.9	51	1.6	111	3.4	171	5.3
52	4 43.0	4 43.8	4 30.1	52	1.6	112	3.5	172	5.3
53	4 43.3	4 44.0	4 30.3	53	1.6	113	3.5	173	5.3
54	4 43.5	4 44.3	4 30.6	54	1.7	114	3.5	174	5.4
55	4 43.8	4 44.5	4 30.8	55	1.7	115	3.5	175	5.4
56	4 44.0	4 44.8	4 31.1	56	1.7	116	3.6	176	5.4
57	4 44.3	4 45.0	4 31.3	57	1.8	117	3.6	177	5.5
58	4 44.5	4 45.3	4 31.5	58	1.8	118	3.6	178	5.5
59	4 44.8	4 45.5	4 31.8	59	1.8	119	3.7	179	5.5
60	4 45.0	4 45.8	4 32.0	60	1.9	120	3.7	180	5.6

19m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	4 45.0	4 45.8	4 32.0	0	0.0	60	2.0	120	3.9
1	4 45.3	4 46.0	4 32.3	1	0.0	61	2.0	121	3.9
2	4 45.5	4 46.3	4 32.5	2	0.1	62	2.0	122	4.0
3	4 45.8	4 46.5	4 32.7	3	0.1	63	2.0	123	4.0
4	4 46.0	4 46.8	4 33.0	4	0.1	64	2.1	124	4.0
5	4 46.3	4 47.0	4 33.2	5	0.2	65	2.1	125	4.1
6	4 46.5	4 47.3	4 33.4	6	0.2	66	2.1	126	4.1
7	4 46.8	4 47.5	4 33.7	7	0.2	67	2.2	127	4.1
8	4 47.0	4 47.8	4 33.9	8	0.3	68	2.2	128	4.2
9	4 47.3	4 48.0	4 34.2	9	0.3	69	2.2	129	4.2
10	4 47.5	4 48.3	4 34.4	10	0.3	70	2.3	130	4.2
11	4 47.8	4 48.5	4 34.6	11	0.4	71	2.3	131	4.3
12	4 48.0	4 48.8	4 34.9	12	0.4	72	2.3	132	4.3
13	4 48.3	4 49.0	4 35.1	13	0.4	73	2.4	133	4.3
14	4 48.5	4 49.3	4 35.4	14	0.5	74	2.4	134	4.4
15	4 48.8	4 49.5	4 35.6	15	0.5	75	2.4	135	4.4
16	4 49.0	4 49.8	4 35.8	16	0.5	76	2.5	136	4.4
17	4 49.3	4 50.0	4 36.1	17	0.6	77	2.5	137	4.5
18	4 49.5	4 50.3	4 36.3	18	0.6	78	2.5	138	4.5
19	4 49.8	4 50.5	4 36.6	19	0.6	79	2.6	139	4.5
20	4 50.0	4 50.8	4 36.8	20	0.7	80	2.6	140	4.6
21	4 50.3	4 51.0	4 37.0	21	0.7	81	2.6	141	4.6
22	4 50.5	4 51.3	4 37.3	22	0.7	82	2.7	142	4.6
23	4 50.8	4 51.5	4 37.5	23	0.7	83	2.7	143	4.6
24	4 51.0	4 51.8	4 37.7	24	0.8	84	2.7	144	4.7
25	4 51.3	4 52.0	4 38.0	25	0.8	85	2.8	145	4.7
26	4 51.5	4 52.3	4 38.2	26	0.8	86	2.8	146	4.7
27	4 51.8	4 52.5	4 38.5	27	0.9	87	2.8	147	4.8
28	4 52.0	4 52.8	4 38.7	28	0.9	88	2.9	148	4.8
29	4 52.3	4 53.1	4 38.9	29	0.9	89	2.9	149	4.8
30	4 52.5	4 53.3	4 39.2	30	1.0	90	2.9	150	4.9
31	4 52.8	4 53.6	4 39.4	31	1.0	91	3.0	151	4.9
32	4 53.0	4 53.8	4 39.7	32	1.0	92	3.0	152	4.9
33	4 53.3	4 54.1	4 39.9	33	1.1	93	3.0	153	5.0
34	4 53.5	4 54.3	4 40.1	34	1.1	94	3.1	154	5.0
35	4 53.8	4 54.6	4 40.4	35	1.1	95	3.1	155	5.0
36	4 54.0	4 54.8	4 40.6	36	1.2	96	3.1	156	5.1
37	4 54.3	4 55.1	4 40.8	37	1.2	97	3.2	157	5.1
38	4 54.5	4 55.3	4 41.1	38	1.2	98	3.2	158	5.1
39	4 54.8	4 55.6	4 41.3	39	1.3	99	3.2	159	5.2
40	4 55.0	4 55.8	4 41.6	40	1.3	100	3.3	160	5.2
41	4 55.3	4 56.1	4 41.8	41	1.3	101	3.3	161	5.2
42	4 55.5	4 56.3	4 42.0	42	1.4	102	3.3	162	5.3
43	4 55.8	4 56.6	4 42.3	43	1.4	103	3.3	163	5.3
44	4 56.0	4 56.8	4 42.5	44	1.4	104	3.4	164	5.3
45	4 56.3	4 57.1	4 42.8	45	1.5	105	3.4	165	5.4
46	4 56.5	4 57.3	4 43.0	46	1.5	106	3.4	166	5.4
47	4 56.8	4 57.6	4 43.2	47	1.5	107	3.5	167	5.4
48	4 57.0	4 57.8	4 43.5	48	1.6	108	3.5	168	5.5
49	4 57.3	4 58.1	4 43.7	49	1.6	109	3.5	169	5.5
50	4 57.5	4 58.3	4 43.9	50	1.6	110	3.6	170	5.5
51	4 57.8	4 58.6	4 44.2	51	1.7	111	3.6	171	5.6
52	4 58.0	4 58.8	4 44.4	52	1.7	112	3.6	172	5.6
53	4 58.3	4 59.1	4 44.7	53	1.7	113	3.7	173	5.6
54	4 58.5	4 59.3	4 44.9	54	1.8	114	3.7	174	5.7
55	4 58.8	4 59.6	4 45.1	55	1.8	115	3.7	175	5.7
56	4 59.0	4 59.8	4 45.4	56	1.8	116	3.8	176	5.7
57	4 59.3	5 00.1	4 45.6	57	1.9	117	3.8	177	5.8
58	4 59.5	5 00.3	4 45.9	58	1.9	118	3.8	178	5.8
59	4 59.8	5 00.6	4 46.1	59	1.9	119	3.9	179	5.8
60	5 00.0	5 00.8	4 46.3	60	2.0	120	3.9	180	5.9

20^m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	5 00.0	5 00.8	4 46.3	0	0.0	60	2.1	120	4.1
1	5 00.3	5 01.1	4 46.6	1	0.0	61	2.1	121	4.1
2	5 00.5	5 01.3	4 46.8	2	0.1	62	2.1	122	4.2
3	5 00.8	5 01.6	4 47.0	3	0.1	63	2.2	123	4.2
4	5 01.0	5 01.8	4 47.3	4	0.1	64	2.2	124	4.2
5	5 01.3	5 02.1	4 47.5	5	0.2	65	2.2	125	4.3
6	5 01.5	5 02.3	4 47.8	6	0.2	66	2.3	126	4.3
7	5 01.8	5 02.6	4 48.0	7	0.2	67	2.3	127	4.3
8	5 02.0	5 02.8	4 48.2	8	0.3	68	2.3	128	4.4
9	5 02.3	5 03.1	4 48.5	9	0.3	69	2.4	129	4.4
10	5 02.5	5 03.3	4 48.7	10	0.3	70	2.4	130	4.4
11	5 02.8	5 03.6	4 49.0	11	0.4	71	2.4	131	4.5
12	5 03.0	5 03.8	4 49.2	12	0.4	72	2.5	132	4.5
13	5 03.3	5 04.1	4 49.4	13	0.4	73	2.5	133	4.5
14	5 03.5	5 04.3	4 49.7	14	0.5	74	2.5	134	4.6
15	5 03.8	5 04.6	4 49.9	15	0.5	75	2.6	135	4.6
16	5 04.0	5 04.8	4 50.2	16	0.5	76	2.6	136	4.6
17	5 04.3	5 05.1	4 50.4	17	0.6	77	2.6	137	4.7
18	5 04.5	5 05.3	4 50.6	18	0.6	78	2.7	138	4.7
19	5 04.8	5 05.6	4 50.9	19	0.6	79	2.7	139	4.7
20	5 05.0	5 05.8	4 51.1	20	0.7	80	2.7	140	4.8
21	5 05.3	5 06.1	4 51.3	21	0.7	81	2.8	141	4.8
22	5 05.5	5 06.3	4 51.6	22	0.8	82	2.8	142	4.9
23	5 05.8	5 06.6	4 51.8	23	0.8	83	2.8	143	4.9
24	5 06.0	5 06.8	4 52.1	24	0.8	84	2.9	144	4.9
25	5 06.3	5 07.1	4 52.3	25	0.9	85	2.9	145	5.0
26	5 06.5	5 07.3	4 52.5	26	0.9	86	2.9	146	5.0
27	5 06.8	5 07.6	4 52.8	27	0.9	87	3.0	147	5.0
28	5 07.0	5 07.8	4 53.0	28	1.0	88	3.0	148	5.1
29	5 07.3	5 08.1	4 53.3	29	1.0	89	3.0	149	5.1
30	5 07.5	5 08.3	4 53.5	30	1.0	90	3.1	150	5.1
31	5 07.8	5 08.6	4 53.7	31	1.1	91	3.1	151	5.2
32	5 08.0	5 08.8	4 54.0	32	1.1	92	3.1	152	5.2
33	5 08.3	5 09.1	4 54.2	33	1.1	93	3.2	153	5.2
34	5 08.5	5 09.3	4 54.4	34	1.2	94	3.2	154	5.3
35	5 08.8	5 09.6	4 54.7	35	1.2	95	3.2	155	5.3
36	5 09.0	5 09.8	4 54.9	36	1.2	96	3.3	156	5.3
37	5 09.3	5 10.1	4 55.2	37	1.3	97	3.3	157	5.4
38	5 09.5	5 10.3	4 55.4	38	1.3	98	3.3	158	5.4
39	5 09.8	5 10.6	4 55.6	39	1.3	99	3.4	159	5.4
40	5 10.0	5 10.8	4 55.9	40	1.4	100	3.4	160	5.5
41	5 10.3	5 11.1	4 56.1	41	1.4	101	3.5	161	5.5
42	5 10.5	5 11.4	4 56.4	42	1.4	102	3.5	162	5.5
43	5 10.8	5 11.6	4 56.6	43	1.5	103	3.5	163	5.6
44	5 11.0	5 11.9	4 56.8	44	1.5	104	3.6	164	5.6
45	5 11.3	5 12.1	4 57.1	45	1.5	105	3.6	165	5.6
46	5 11.5	5 12.4	4 57.3	46	1.6	106	3.6	166	5.7
47	5 11.8	5 12.6	4 57.5	47	1.6	107	3.7	167	5.7
48	5 12.0	5 12.9	4 57.8	48	1.6	108	3.7	168	5.7
49	5 12.3	5 13.1	4 58.0	49	1.7	109	3.7	169	5.8
50	5 12.5	5 13.4	4 58.3	50	1.7	110	3.8	170	5.8
51	5 12.8	5 13.6	4 58.5	51	1.7	111	3.8	171	5.8
52	5 13.0	5 13.9	4 58.7	52	1.8	112	3.8	172	5.9
53	5 13.3	5 14.1	4 59.0	53	1.8	113	3.9	173	5.9
54	5 13.5	5 14.4	4 59.2	54	1.8	114	3.9	174	5.9
55	5 13.8	5 14.6	4 59.5	55	1.9	115	3.9	175	6.0
56	5 14.0	5 14.9	4 59.7	56	1.9	116	4.0	176	6.0
57	5 14.3	5 15.1	4 59.9	57	1.9	117	4.0	177	6.0
58	5 14.5	5 15.4	5 00.2	58	2.0	118	4.0	178	6.1
59	5 14.8	5 15.6	5 00.4	59	2.0	119	4.1	179	6.1
60	5 15.0	5 15.9	5 00.7	60	2.1	120	4.1	180	6.2

21^m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	5 15.0	5 15.9	5 00.7	0	0.0	60	2.2	120	4.3
1	5 15.3	5 16.1	5 00.9	1	0.0	61	2.2	121	4.3
2	5 15.5	5 16.4	5 01.1	2	0.1	62	2.2	122	4.4
3	5 15.8	5 16.6	5 01.4	3	0.1	63	2.3	123	4.4
4	5 16.0	5 16.9	5 01.6	4	0.1	64	2.3	124	4.4
5	5 16.3	5 17.1	5 01.8	5	0.2	65	2.3	125	4.5
6	5 16.5	5 17.4	5 02.1	6	0.2	66	2.4	126	4.5
7	5 16.8	5 17.6	5 02.3	7	0.3	67	2.4	127	4.6
8	5 17.0	5 17.9	5 02.6	8	0.3	68	2.4	128	4.6
9	5 17.3	5 18.1	5 02.8	9	0.3	69	2.5	129	4.6
10	5 17.5	5 18.4	5 03.0	10	0.4	70	2.5	130	4.7
11	5 17.8	5 18.6	5 03.3	11	0.4	71	2.5	131	4.7
12	5 18.0	5 18.9	5 03.5	12	0.4	72	2.6	132	4.7
13	5 18.3	5 19.1	5 03.8	13	0.5	73	2.6	133	4.8
14	5 18.5	5 19.4	5 04.0	14	0.5	74	2.7	134	4.8
15	5 18.8	5 19.6	5 04.2	15	0.5	75	2.7	135	4.8
16	5 19.0	5 19.9	5 04.5	16	0.6	76	2.7	136	4.9
17	5 19.3	5 20.1	5 04.7	17	0.6	77	2.8	137	4.9
18	5 19.5	5 20.4	5 04.9	18	0.6	78	2.8	138	4.9
19	5 19.8	5 20.6	5 05.2	19	0.7	79	2.8	139	5.0
20	5 20.0	5 20.9	5 05.4	20	0.7	80	2.9	140	5.0
21	5 20.3	5 21.1	5 05.7	21	0.8	81	2.9	141	5.1
22	5 20.5	5 21.4	5 05.9	22	0.8	82	2.9	142	5.1
23	5 20.8	5 21.6	5 06.1	23	0.8	83	3.0	143	5.1
24	5 21.0	5 21.9	5 06.4	24	0.9	84	3.0	144	5.2
25	5 21.3	5 22.1	5 06.6	25	0.9	85	3.0	145	5.2
26	5 21.5	5 22.4	5 06.9	26	0.9	86	3.1	146	5.2
27	5 21.8	5 22.6	5 07.1	27	1.0	87	3.1	147	5.3
28	5 22.0	5 22.9	5 07.3	28	1.0	88	3.2	148	5.3
29	5 22.3	5 23.1	5 07.6	29	1.0	89	3.2	149	5.3
30	5 22.5	5 23.4	5 07.8	30	1.1	90	3.2	150	5.4
31	5 22.8	5 23.6	5 08.0	31	1.1	91	3.3	151	5.4
32	5 23.0	5 23.9	5 08.3	32	1.1	92	3.3	152	5.4
33	5 23.3	5 24.1	5 08.5	33	1.2	93	3.3	153	5.5
34	5 23.5	5 24.4	5 08.8	34	1.2	94	3.4	154	5.5
35	5 23.8	5 24.6	5 09.0	35	1.3	95	3.4	155	5.6
36	5 24.0	5 24.9	5 09.2	36	1.3	96	3.4	156	5.6
37	5 24.3	5 25.1	5 09.5	37	1.3	97	3.5	157	5.6
38	5 24.5	5 25.4	5 09.7	38	1.4	98	3.5	158	5.7
39	5 24.8	5 25.6	5 10.0	39	1.4	99	3.5	159	5.7
40	5 25.0	5 25.9	5 10.2	40	1.4	100	3.6	160	5.7
41	5 25.3	5 26.1	5 10.4	41	1.5	101	3.6	161	5.8
42	5 25.5	5 26.4	5 10.7	42	1.5	102	3.7	162	5.8
43	5 25.8	5 26.6	5 10.9	43	1.5	103	3.7	163	5.8
44	5 26.0	5 26.9	5 11.1	44	1.6	104	3.7	164	5.9
45	5 26.3	5 27.1	5 11.4	45	1.6	105	3.8	165	5.9
46	5 26.5	5 27.4	5 11.6	46	1.6	106	3.8	166	5.9
47	5 26.8	5 27.6	5 11.9	47	1.7	107	3.8	167	6.0
48	5 27.0	5 27.9	5 12.1	48	1.7	108	3.9	168	6.0
49	5 27.3	5 28.1	5 12.3	49	1.8	109	3.9	169	6.1
50	5 27.5	5 28.4	5 12.6	50	1.8	110	3.9	170	6.1
51	5 27.8	5 28.6	5 12.8	51	1.8	111	4.0	171	6.1
52	5 28.0	5 28.9	5 13.1	52	1.9	112	4.0	172	6.2
53	5 28.3	5 29.1	5 13.3	53	1.9	113	4.0	173	6.2
54	5 28.5	5 29.4	5 13.5	54	1.9	114	4.1	174	6.2
55	5 28.8	5 29.7	5 13.8	55	2.0	115	4.1	175	6.3
56	5 29.0	5 29.9	5 14.0	56	2.0	116	4.2	176	6.3
57	5 29.3	5 30.2	5 14.3	57	2.0	117	4.2	177	6.3
58	5 29.5	5 30.4	5 14.5	58	2.1	118	4.2	178	6.4
59	5 29.8	5 30.7	5 14.7	59	2.1	119	4.3	179	6.4
60	5 30.0	5 30.9	5 15.0	60	2.2	120	4.3	180	6.5

22m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	5 30.0	5 30.9	5 15.0	0	0.0	60	2.3	120	4.5
1	5 30.3	5 31.2	5 15.2	1	0.0	61	2.3	121	4.5
2	5 30.5	5 31.4	5 15.4	2	0.1	62	2.3	122	4.6
3	5 30.8	5 31.7	5 15.7	3	0.1	63	2.4	123	4.6
4	5 31.0	5 31.9	5 15.9	4	0.2	64	2.4	124	4.7
5	5 31.3	5 32.2	5 16.2	5	0.2	65	2.4	125	4.7
6	5 31.5	5 32.4	5 16.4	6	0.2	66	2.5	126	4.7
7	5 31.8	5 32.7	5 16.6	7	0.3	67	2.5	127	4.8
8	5 32.0	5 32.9	5 16.9	8	0.3	68	2.6	128	4.8
9	5 32.3	5 33.2	5 17.1	9	0.3	69	2.6	129	4.8
10	5 32.5	5 33.4	5 17.4	10	0.4	70	2.6	130	4.9
11	5 32.8	5 33.7	5 17.6	11	0.4	71	2.7	131	4.9
12	5 33.0	5 33.9	5 17.8	12	0.5	72	2.7	132	5.0
13	5 33.3	5 34.2	5 18.1	13	0.5	73	2.7	133	5.0
14	5 33.5	5 34.4	5 18.3	14	0.5	74	2.8	134	5.0
15	5 33.8	5 34.7	5 18.5	15	0.6	75	2.8	135	5.1
16	5 34.0	5 34.9	5 18.8	16	0.6	76	2.9	136	5.1
17	5 34.3	5 35.2	5 19.0	17	0.6	77	2.9	137	5.1
18	5 34.5	5 35.4	5 19.3	18	0.7	78	2.9	138	5.2
19	5 34.8	5 35.7	5 19.5	19	0.7	79	3.0	139	5.2
20	5 35.0	5 35.9	5 19.7	20	0.8	80	3.0	140	5.3
21	5 35.3	5 36.2	5 20.0	21	0.8	81	3.0	141	5.3
22	5 35.5	5 36.4	5 20.2	22	0.8	82	3.1	142	5.3
23	5 35.8	5 36.7	5 20.5	23	0.9	83	3.1	143	5.4
24	5 36.0	5 36.9	5 20.7	24	0.9	84	3.2	144	5.4
25	5 36.3	5 37.2	5 20.9	25	0.9	85	3.2	145	5.4
26	5 36.5	5 37.4	5 21.2	26	1.0	86	3.2	146	5.5
27	5 36.8	5 37.7	5 21.4	27	1.0	87	3.3	147	5.5
28	5 37.0	5 37.9	5 21.6	28	1.1	88	3.3	148	5.6
29	5 37.3	5 38.2	5 21.9	29	1.1	89	3.3	149	5.6
30	5 37.5	5 38.4	5 22.1	30	1.1	90	3.4	150	5.6
31	5 37.8	5 38.7	5 22.4	31	1.2	91	3.4	151	5.7
32	5 38.0	5 38.9	5 22.6	32	1.2	92	3.5	152	5.7
33	5 38.3	5 39.2	5 22.8	33	1.2	93	3.5	153	5.7
34	5 38.5	5 39.4	5 23.1	34	1.3	94	3.5	154	5.8
35	5 38.8	5 39.7	5 23.3	35	1.3	95	3.6	155	5.8
36	5 39.0	5 39.9	5 23.6	36	1.4	96	3.6	156	5.9
37	5 39.3	5 40.2	5 23.8	37	1.4	97	3.6	157	5.9
38	5 39.5	5 40.4	5 24.0	38	1.4	98	3.7	158	5.9
39	5 39.8	5 40.7	5 24.3	39	1.5	99	3.7	159	6.0
40	5 40.0	5 40.9	5 24.5	40	1.5	100	3.8	160	6.0
41	5 40.3	5 41.2	5 24.7	41	1.5	101	3.8	161	6.0
42	5 40.5	5 41.4	5 25.0	42	1.6	102	3.8	162	6.1
43	5 40.8	5 41.7	5 25.2	43	1.6	103	3.9	163	6.1
44	5 41.0	5 41.9	5 25.5	44	1.7	104	3.9	164	6.2
45	5 41.3	5 42.2	5 25.7	45	1.7	105	3.9	165	6.2
46	5 41.5	5 42.4	5 25.9	46	1.7	106	4.0	166	6.2
47	5 41.8	5 42.7	5 26.2	47	1.8	107	4.0	167	6.3
48	5 42.0	5 42.9	5 26.4	48	1.8	108	4.1	168	6.3
49	5 42.3	5 43.2	5 26.7	49	1.8	109	4.1	169	6.3
50	5 42.5	5 43.4	5 26.9	50	1.9	110	4.1	170	6.4
51	5 42.8	5 43.7	5 27.1	51	1.9	111	4.2	171	6.4
52	5 43.0	5 43.9	5 27.4	52	2.0	112	4.2	172	6.5
53	5 43.3	5 44.2	5 27.6	53	2.0	113	4.2	173	6.5
54	5 43.5	5 44.4	5 27.9	54	2.0	114	4.3	174	6.5
55	5 43.8	5 44.7	5 28.1	55	2.1	115	4.3	175	6.6
56	5 44.0	5 44.9	5 28.3	56	2.1	116	4.4	176	6.6
57	5 44.3	5 45.2	5 28.6	57	2.1	117	4.4	177	6.6
58	5 44.5	5 45.4	5 28.8	58	2.2	118	4.4	178	6.7
59	5 44.8	5 45.7	5 29.0	59	2.2	119	4.5	179	6.7
60	5 45.0	5 45.9	5 29.3	60	2.3	120	4.5	180	6.8

23m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	5 45.0	5 45.9	5 29.3	0	0.0	60	2.4	120	4.7
1	5 45.3	5 46.2	5 29.5	1	0.0	61	2.4	121	4.7
2	5 45.5	5 46.4	5 29.8	2	0.1	62	2.4	122	4.8
3	5 45.8	5 46.7	5 30.0	3	0.1	63	2.5	123	4.8
4	5 46.0	5 46.9	5 30.2	4	0.2	64	2.5	124	4.9
5	5 46.3	5 47.2	5 30.5	5	0.2	65	2.5	125	4.9
6	5 46.5	5 47.4	5 30.7	6	0.2	66	2.6	126	4.9
7	5 46.8	5 47.7	5 31.0	7	0.3	67	2.6	127	5.0
8	5 47.0	5 48.0	5 31.2	8	0.3	68	2.7	128	5.0
9	5 47.3	5 48.2	5 31.4	9	0.4	69	2.7	129	5.1
10	5 47.5	5 48.5	5 31.7	10	0.4	70	2.7	130	5.1
11	5 47.8	5 48.7	5 31.9	11	0.4	71	2.8	131	5.1
12	5 48.0	5 49.0	5 32.1	12	0.5	72	2.8	132	5.2
13	5 48.3	5 49.2	5 32.4	13	0.5	73	2.9	133	5.2
14	5 48.5	5 49.5	5 32.6	14	0.5	74	2.9	134	5.2
15	5 48.8	5 49.7	5 32.9	15	0.6	75	2.9	135	5.3
16	5 49.0	5 50.0	5 33.1	16	0.6	76	3.0	136	5.3
17	5 49.3	5 50.2	5 33.3	17	0.7	77	3.0	137	5.4
18	5 49.5	5 50.5	5 33.6	18	0.7	78	3.1	138	5.4
19	5 49.8	5 50.7	5 33.8	19	0.7	79	3.1	139	5.4
20	5 50.0	5 51.0	5 34.1	20	0.8	80	3.1	140	5.5
21	5 50.3	5 51.2	5 34.3	21	0.8	81	3.2	141	5.5
22	5 50.5	5 51.5	5 34.5	22	0.9	82	3.2	142	5.6
23	5 50.8	5 51.7	5 34.8	23	0.9	83	3.3	143	5.6
24	5 51.0	5 52.0	5 35.0	24	0.9	84	3.3	144	5.6
25	5 51.3	5 52.2	5 35.2	25	1.0	85	3.3	145	5.7
26	5 51.5	5 52.5	5 35.5	26	1.0	86	3.4	146	5.7
27	5 51.8	5 52.7	5 35.7	27	1.1	87	3.4	147	5.8
28	5 52.0	5 53.0	5 36.0	28	1.1	88	3.4	148	5.8
29	5 52.3	5 53.2	5 36.2	29	1.1	89	3.5	149	5.8
30	5 52.5	5 53.5	5 36.4	30	1.2	90	3.5	150	5.9
31	5 52.8	5 53.7	5 36.7	31	1.2	91	3.6	151	5.9
32	5 53.0	5 54.0	5 36.9	32	1.3	92	3.6	152	6.0
33	5 53.3	5 54.2	5 37.2	33	1.3	93	3.6	153	6.0
34	5 53.5	5 54.5	5 37.4	34	1.3	94	3.7	154	6.0
35	5 53.8	5 54.7	5 37.6	35	1.4	95	3.7	155	6.1
36	5 54.0	5 55.0	5 37.9	36	1.4	96	3.8	156	6.1
37	5 54.3	5 55.2	5 38.1	37	1.4	97	3.8	157	6.1
38	5 54.5	5 55.5	5 38.4	38	1.5	98	3.8	158	6.2
39	5 54.8	5 55.7	5 38.6	39	1.5	99	3.9	159	6.2
40	5 55.0	5 56.0	5 38.8	40	1.6	100	3.9	160	6.3
41	5 55.3	5 56.2	5 39.1	41	1.6	101	4.0	161	6.3
42	5 55.5	5 56.5	5 39.3	42	1.6	102	4.0	162	6.3
43	5 55.8	5 56.7	5 39.5	43	1.7	103	4.0	163	6.4
44	5 56.0	5 57.0	5 39.8	44	1.7	104	4.1	164	6.4
45	5 56.3	5 57.2	5 40.0	45	1.8	105	4.1	165	6.5
46	5 56.5	5 57.5	5 40.3	46	1.8	106	4.2	166	6.5
47	5 56.8	5 57.7	5 40.5	47	1.8	107	4.2	167	6.5
48	5 57.0	5 58.0	5 40.7	48	1.9	108	4.2	168	6.6
49	5 57.3	5 58.2	5 41.0	49	1.9	109	4.3	169	6.6
50	5 57.5	5 58.5	5 41.2	50	2.0	110	4.3	170	6.7
51	5 57.8	5 58.7	5 41.5	51	2.0	111	4.3	171	6.7
52	5 58.0	5 59.0	5 41.7	52	2.0	112	4.4	172	6.7
53	5 58.3	5 59.2	5 41.9	53	2.1	113	4.4	173	6.8
54	5 58.5	5 59.5	5 42.2	54	2.1	114	4.5	174	6.8
55	5 58.8	5 59.7	5 42.4	55	2.2	115	4.5	175	6.9
56	5 59.0	6 00.0	5 42.6	56	2.2	116	4.5	176	6.9
57	5 59.3	6 00.2	5 42.9	57	2.2	117	4.6	177	6.9
58	5 59.5	6 00.5	5 43.1	58	2.3	118	4.6	178	7.0
59	5 59.8	6 00.7	5 43.4	59	2.3	119	4.7	179	7.0
60	6 00.0	6 01.0	5 43.6	60	2.4	120	4.7	180	7.1

24m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	6 00.0	6 01.0	5 43.6	0	0.0	60	2.5	120	4.9
1	6 00.3	6 01.2	5 43.8	1	0.0	61	2.5	121	4.9
2	6 00.5	6 01.5	5 44.1	2	0.1	62	2.5	122	5.0
3	6 00.8	6 01.7	5 44.3	3	0.1	63	2.6	123	5.0
4	6 01.0	6 02.0	5 44.6	4	0.2	64	2.6	124	5.1
5	6 01.3	6 02.2	5 44.8	5	0.2	65	2.7	125	5.1
6	6 01.5	6 02.5	5 45.0	6	0.2	66	2.7	126	5.1
7	6 01.8	6 02.7	5 45.3	7	0.3	67	2.7	127	5.2
8	6 02.0	6 03.0	5 45.5	8	0.3	68	2.8	128	5.2
9	6 02.3	6 03.2	5 45.7	9	0.4	69	2.8	129	5.3
10	6 02.5	6 03.5	5 46.0	10	0.4	70	2.9	130	5.3
11	6 02.8	6 03.7	5 46.2	11	0.4	71	2.9	131	5.3
12	6 03.0	6 04.0	5 46.5	12	0.5	72	2.9	132	5.4
13	6 03.3	6 04.2	5 46.7	13	0.5	73	3.0	133	5.4
14	6 03.5	6 04.5	5 46.9	14	0.6	74	3.0	134	5.5
15	6 03.8	6 04.7	5 47.2	15	0.6	75	3.1	135	5.5
16	6 04.0	6 05.0	5 47.4	16	0.7	76	3.1	136	5.6
17	6 04.3	6 05.2	5 47.7	17	0.7	77	3.1	137	5.6
18	6 04.5	6 05.5	5 47.9	18	0.7	78	3.2	138	5.6
19	6 04.8	6 05.7	5 48.1	19	0.8	79	3.2	139	5.7
20	6 05.0	6 06.0	5 48.4	20	0.8	80	3.3	140	5.7
21	6 05.3	6 06.3	5 48.6	21	0.9	81	3.3	141	5.8
22	6 05.5	6 06.5	5 48.8	22	0.9	82	3.3	142	5.8
23	6 05.8	6 06.8	5 49.1	23	0.9	83	3.4	143	5.8
24	6 06.0	6 07.0	5 49.3	24	1.0	84	3.4	144	5.9
25	6 06.3	6 07.3	5 49.6	25	1.0	85	3.5	145	5.9
26	6 06.5	6 07.5	5 49.8	26	1.1	86	3.5	146	6.0
27	6 06.8	6 07.8	5 50.0	27	1.1	87	3.6	147	6.0
28	6 07.0	6 08.0	5 50.3	28	1.1	88	3.6	148	6.0
29	6 07.3	6 08.3	5 50.5	29	1.2	89	3.6	149	6.1
30	6 07.5	6 08.5	5 50.8	30	1.2	90	3.7	150	6.1
31	6 07.8	6 08.8	5 51.0	31	1.3	91	3.7	151	6.2
32	6 08.0	6 09.0	5 51.2	32	1.3	92	3.8	152	6.2
33	6 08.3	6 09.3	5 51.5	33	1.3	93	3.8	153	6.2
34	6 08.5	6 09.5	5 51.7	34	1.4	94	3.8	154	6.3
35	6 08.8	6 09.8	5 52.0	35	1.4	95	3.9	155	6.3
36	6 09.0	6 10.0	5 52.2	36	1.5	96	3.9	156	6.4
37	6 09.3	6 10.3	5 52.4	37	1.5	97	4.0	157	6.4
38	6 09.5	6 10.5	5 52.7	38	1.6	98	4.0	158	6.5
39	6 09.8	6 10.8	5 52.9	39	1.6	99	4.0	159	6.5
40	6 10.0	6 11.0	5 53.1	40	1.6	100	4.1	160	6.5
41	6 10.3	6 11.3	5 53.4	41	1.7	101	4.1	161	6.6
42	6 10.5	6 11.5	5 53.6	42	1.7	102	4.2	162	6.6
43	6 10.8	6 11.8	5 53.9	43	1.8	103	4.2	163	6.7
44	6 11.0	6 12.0	5 54.1	44	1.8	104	4.2	164	6.7
45	6 11.3	6 12.3	5 54.3	45	1.8	105	4.3	165	6.7
46	6 11.5	6 12.5	5 54.6	46	1.9	106	4.3	166	6.8
47	6 11.8	6 12.8	5 54.8	47	1.9	107	4.4	167	6.8
48	6 12.0	6 13.0	5 55.1	48	2.0	108	4.4	168	6.9
49	6 12.3	6 13.3	5 55.3	49	2.0	109	4.5	169	6.9
50	6 12.5	6 13.5	5 55.5	50	2.0	110	4.5	170	6.9
51	6 12.8	6 13.8	5 55.8	51	2.1	111	4.5	171	7.0
52	6 13.0	6 14.0	5 56.0	52	2.1	112	4.6	172	7.0
53	6 13.3	6 14.3	5 56.2	53	2.2	113	4.6	173	7.1
54	6 13.5	6 14.5	5 56.5	54	2.2	114	4.7	174	7.1
55	6 13.8	6 14.8	5 56.7	55	2.2	115	4.7	175	7.1
56	6 14.0	6 15.0	5 57.0	56	2.3	116	4.7	176	7.2
57	6 14.3	6 15.3	5 57.2	57	2.3	117	4.8	177	7.2
58	6 14.5	6 15.5	5 57.4	58	2.4	118	4.8	178	7.3
59	6 14.8	6 15.8	5 57.7	59	2.4	119	4.9	179	7.3
60	6 15.0	6 16.0	5 57.9	60	2.5	120	4.9	180	7.4

25m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	6 15.0	6 16.0	5 57.9	0	0.0	60	2.6	120	5.1
1	6 15.3	6 16.3	5 58.2	1	0.0	61	2.6	121	5.1
2	6 15.5	6 16.5	5 58.4	2	0.1	62	2.6	122	5.2
3	6 15.8	6 16.8	5 58.6	3	0.1	63	2.7	123	5.2
4	6 16.0	6 17.0	5 58.9	4	0.2	64	2.7	124	5.3
5	6 16.3	6 17.3	5 59.1	5	0.2	65	2.8	125	5.3
6	6 16.5	6 17.5	5 59.3	6	0.3	66	2.8	126	5.4
7	6 16.8	6 17.8	5 59.6	7	0.3	67	2.8	127	5.4
8	6 17.0	6 18.0	5 59.8	8	0.3	68	2.9	128	5.4
9	6 17.3	6 18.3	6 00.1	9	0.4	69	2.9	129	5.5
10	6 17.5	6 18.5	6 00.3	10	0.4	70	3.0	130	5.5
11	6 17.8	6 18.8	6 00.5	11	0.5	71	3.0	131	5.6
12	6 18.0	6 19.0	6 00.8	12	0.5	72	3.1	132	5.6
13	6 18.3	6 19.3	6 01.0	13	0.6	73	3.1	133	5.7
14	6 18.5	6 19.5	6 01.3	14	0.6	74	3.1	134	5.7
15	6 18.8	6 19.8	6 01.5	15	0.6	75	3.2	135	5.7
16	6 19.0	6 20.0	6 01.7	16	0.7	76	3.2	136	5.8
17	6 19.3	6 20.3	6 02.0	17	0.7	77	3.3	137	5.8
18	6 19.5	6 20.5	6 02.2	18	0.8	78	3.3	138	5.9
19	6 19.8	6 20.8	6 02.5	19	0.8	79	3.4	139	5.9
20	6 20.0	6 21.0	6 02.7	20	0.9	80	3.4	140	6.0
21	6 20.3	6 21.3	6 02.9	21	0.9	81	3.4	141	6.0
22	6 20.5	6 21.5	6 03.2	22	0.9	82	3.5	142	6.0
23	6 20.8	6 21.8	6 03.4	23	1.0	83	3.5	143	6.1
24	6 21.0	6 22.0	6 03.6	24	1.0	84	3.6	144	6.1
25	6 21.3	6 22.3	6 03.9	25	1.1	85	3.6	145	6.2
26	6 21.5	6 22.5	6 04.1	26	1.1	86	3.7	146	6.2
27	6 21.8	6 22.8	6 04.4	27	1.1	87	3.7	147	6.2
28	6 22.0	6 23.0	6 04.6	28	1.2	88	3.7	148	6.3
29	6 22.3	6 23.3	6 04.8	29	1.2	89	3.8	149	6.3
30	6 22.5	6 23.5	6 05.1	30	1.3	90	3.8	150	6.4
31	6 22.8	6 23.8	6 05.3	31	1.3	91	3.9	151	6.4
32	6 23.0	6 24.0	6 05.6	32	1.4	92	3.9	152	6.5
33	6 23.3	6 24.3	6 05.8	33	1.4	93	4.0	153	6.5
34	6 23.5	6 24.5	6 06.0	34	1.4	94	4.0	154	6.5
35	6 23.8	6 24.8	6 06.3	35	1.5	95	4.0	155	6.6
36	6 24.0	6 25.1	6 06.5	36	1.5	96	4.1	156	6.6
37	6 24.3	6 25.3	6 06.7	37	1.6	97	4.1	157	6.7
38	6 24.5	6 25.6	6 07.0	38	1.6	98	4.2	158	6.7
39	6 24.8	6 25.8	6 07.2	39	1.7	99	4.2	159	6.8
40	6 25.0	6 26.1	6 07.5	40	1.7	100	4.3	160	6.8
41	6 25.3	6 26.3	6 07.7	41	1.7	101	4.3	161	6.8
42	6 25.5	6 26.6	6 07.9	42	1.8	102	4.3	162	6.9
43	6 25.8	6 26.8	6 08.2	43	1.8	103	4.4	163	6.9
44	6 26.0	6 27.1	6 08.4	44	1.9	104	4.4	164	7.0
45	6 26.3	6 27.3	6 08.7	45	1.9	105	4.5	165	7.0
46	6 26.5	6 27.6	6 08.9	46	2.0	106	4.5	166	7.1
47	6 26.8	6 27.8	6 09.1	47	2.0	107	4.5	167	7.1
48	6 27.0	6 28.1	6 09.4	48	2.0	108	4.6	168	7.1
49	6 27.3	6 28.3	6 09.6	49	2.1	109	4.6	169	7.2
50	6 27.5	6 28.6	6 09.8	50	2.1	110	4.7	170	7.2
51	6 27.8	6 28.8	6 10.1	51	2.2	111	4.7	171	7.3
52	6 28.0	6 29.1	6 10.3	52	2.2	112	4.8	172	7.3
53	6 28.3	6 29.3	6 10.6	53	2.3	113	4.8	173	7.4
54	6 28.5	6 29.6	6 10.8	54	2.3	114	4.8	174	7.4
55	6 28.8	6 29.8	6 11.0	55	2.3	115	4.9	175	7.4
56	6 29.0	6 30.1	6 11.3	56	2.4	116	4.9	176	7.5
57	6 29.3	6 30.3	6 11.5	57	2.4	117	5.0	177	7.5
58	6 29.5	6 30.6	6 11.8	58	2.5	118	5.0	178	7.6
59	6 29.8	6 30.8	6 12.0	59	2.5	119	5.1	179	7.6
60	6 30.0	6 31.1	6 12.2	60	2.6	120	5.1	180	7.7

26m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	6 30.0	6 31.1	6 12.2	0	0.0	60	2.7	120	5.3
1	6 30.3	6 31.3	6 12.5	1	0.0	61	2.7	121	5.3
2	6 30.5	6 31.6	6 12.7	2	0.1	62	2.7	122	5.4
3	6 30.8	6 31.8	6 12.9	3	0.1	63	2.8	123	5.4
4	6 31.0	6 32.1	6 13.2	4	0.2	64	2.8	124	5.5
5	6 31.3	6 32.3	6 13.4	5	0.2	65	2.9	125	5.5
6	6 31.5	6 32.6	6 13.7	6	0.3	66	2.9	126	5.6
7	6 31.8	6 32.8	6 13.9	7	0.3	67	3.0	127	5.6
8	6 32.0	6 33.1	6 14.1	8	0.4	68	3.0	128	5.7
9	6 32.3	6 33.3	6 14.4	9	0.4	69	3.0	129	5.7
10	6 32.5	6 33.6	6 14.6	10	0.4	70	3.1	130	5.7
11	6 32.8	6 33.8	6 14.9	11	0.5	71	3.1	131	5.8
12	6 33.0	6 34.1	6 15.1	12	0.5	72	3.2	132	5.8
13	6 33.3	6 34.3	6 15.3	13	0.6	73	3.2	133	5.9
14	6 33.5	6 34.6	6 15.6	14	0.6	74	3.3	134	5.9
15	6 33.8	6 34.8	6 15.8	15	0.7	75	3.3	135	6.0
16	6 34.0	6 35.1	6 16.1	16	0.7	76	3.4	136	6.0
17	6 34.3	6 35.3	6 16.3	17	0.8	77	3.4	137	6.1
18	6 34.5	6 35.6	6 16.5	18	0.8	78	3.4	138	6.1
19	6 34.8	6 35.8	6 16.8	19	0.8	79	3.5	139	6.1
20	6 35.0	6 36.1	6 17.0	20	0.9	80	3.5	140	6.2
21	6 35.3	6 36.3	6 17.2	21	0.9	81	3.6	141	6.2
22	6 35.5	6 36.6	6 17.5	22	1.0	82	3.6	142	6.3
23	6 35.8	6 36.8	6 17.7	23	1.0	83	3.7	143	6.3
24	6 36.0	6 37.1	6 18.0	24	1.1	84	3.7	144	6.4
25	6 36.3	6 37.3	6 18.2	25	1.1	85	3.8	145	6.4
26	6 36.5	6 37.6	6 18.4	26	1.1	86	3.8	146	6.4
27	6 36.8	6 37.8	6 18.7	27	1.2	87	3.8	147	6.5
28	6 37.0	6 38.1	6 18.9	28	1.2	88	3.9	148	6.5
29	6 37.3	6 38.3	6 19.2	29	1.3	89	3.9	149	6.6
30	6 37.5	6 38.6	6 19.4	30	1.3	90	4.0	150	6.6
31	6 37.8	6 38.8	6 19.6	31	1.4	91	4.0	151	6.7
32	6 38.0	6 39.1	6 19.9	32	1.4	92	4.1	152	6.7
33	6 38.3	6 39.3	6 20.1	33	1.5	93	4.1	153	6.8
34	6 38.5	6 39.6	6 20.3	34	1.5	94	4.2	154	6.8
35	6 38.8	6 39.8	6 20.6	35	1.5	95	4.2	155	6.8
36	6 39.0	6 40.1	6 20.8	36	1.6	96	4.2	156	6.9
37	6 39.3	6 40.3	6 21.1	37	1.6	97	4.3	157	6.9
38	6 39.5	6 40.6	6 21.3	38	1.7	98	4.3	158	7.0
39	6 39.8	6 40.8	6 21.5	39	1.7	99	4.4	159	7.0
40	6 40.0	6 41.1	6 21.8	40	1.8	100	4.4	160	7.1
41	6 40.3	6 41.3	6 22.0	41	1.8	101	4.5	161	7.1
42	6 40.5	6 41.6	6 22.3	42	1.9	102	4.5	162	7.2
43	6 40.8	6 41.8	6 22.5	43	1.9	103	4.5	163	7.2
44	6 41.0	6 42.1	6 22.7	44	1.9	104	4.6	164	7.2
45	6 41.3	6 42.3	6 23.0	45	2.0	105	4.6	165	7.3
46	6 41.5	6 42.6	6 23.2	46	2.0	106	4.7	166	7.3
47	6 41.8	6 42.8	6 23.4	47	2.1	107	4.7	167	7.4
48	6 42.0	6 43.1	6 23.7	48	2.1	108	4.8	168	7.4
49	6 42.3	6 43.4	6 23.9	49	2.2	109	4.8	169	7.5
50	6 42.5	6 43.6	6 24.2	50	2.2	110	4.9	170	7.5
51	6 42.8	6 43.9	6 24.4	51	2.3	111	4.9	171	7.6
52	6 43.0	6 44.1	6 24.6	52	2.3	112	4.9	172	7.6
53	6 43.3	6 44.4	6 24.9	53	2.3	113	5.0	173	7.6
54	6 43.5	6 44.6	6 25.1	54	2.4	114	5.0	174	7.7
55	6 43.8	6 44.9	6 25.4	55	2.4	115	5.1	175	7.7
56	6 44.0	6 45.1	6 25.6	56	2.5	116	5.1	176	7.8
57	6 44.3	6 45.4	6 25.8	57	2.5	117	5.2	177	7.8
58	6 44.5	6 45.6	6 26.1	58	2.6	118	5.2	178	7.9
59	6 44.8	6 45.9	6 26.3	59	2.6	119	5.3	179	7.9
60	6 45.0	6 46.1	6 26.6	60	2.7	120	5.3	180	8.0

27m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	6 45.0	6 46.1	6 26.6	0	0.0	60	2.8	120	5.5
1	6 45.3	6 46.4	6 26.8	1	0.0	61	2.8	121	5.5
2	6 45.5	6 46.6	6 27.0	2	0.1	62	2.8	122	5.6
3	6 45.8	6 46.9	6 27.3	3	0.1	63	2.9	123	5.6
4	6 46.0	6 47.1	6 27.5	4	0.2	64	2.9	124	5.7
5	6 46.3	6 47.4	6 27.7	5	0.2	65	3.0	125	5.7
6	6 46.5	6 47.6	6 28.0	6	0.3	66	3.0	126	5.8
7	6 46.8	6 47.9	6 28.2	7	0.3	67	3.1	127	5.8
8	6 47.0	6 48.1	6 28.5	8	0.4	68	3.1	128	5.9
9	6 47.3	6 48.4	6 28.7	9	0.4	69	3.2	129	5.9
10	6 47.5	6 48.6	6 28.9	10	0.5	70	3.2	130	6.0
11	6 47.8	6 48.9	6 29.2	11	0.5	71	3.3	131	6.0
12	6 48.0	6 49.1	6 29.4	12	0.6	72	3.3	132	6.1
13	6 48.3	6 49.4	6 29.7	13	0.6	73	3.3	133	6.1
14	6 48.5	6 49.6	6 29.9	14	0.6	74	3.4	134	6.1
15	6 48.8	6 49.9	6 30.1	15	0.7	75	3.4	135	6.2
16	6 49.0	6 50.1	6 30.4	16	0.7	76	3.5	136	6.2
17	6 49.3	6 50.4	6 30.6	17	0.8	77	3.5	137	6.3
18	6 49.5	6 50.6	6 30.8	18	0.8	78	3.6	138	6.3
19	6 49.8	6 50.9	6 31.1	19	0.9	79	3.6	139	6.4
20	6 50.0	6 51.1	6 31.3	20	0.9	80	3.7	140	6.4
21	6 50.3	6 51.4	6 31.6	21	1.0	81	3.7	141	6.5
22	6 50.5	6 51.6	6 31.8	22	1.0	82	3.8	142	6.5
23	6 50.8	6 51.9	6 32.0	23	1.1	83	3.8	143	6.6
24	6 51.0	6 52.1	6 32.3	24	1.1	84	3.9	144	6.6
25	6 51.3	6 52.4	6 32.5	25	1.1	85	3.9	145	6.6
26	6 51.5	6 52.6	6 32.8	26	1.2	86	3.9	146	6.7
27	6 51.8	6 52.9	6 33.0	27	1.2	87	4.0	147	6.7
28	6 52.0	6 53.1	6 33.2	28	1.3	88	4.0	148	6.8
29	6 52.3	6 53.4	6 33.5	29	1.3	89	4.1	149	6.8
30	6 52.5	6 53.6	6 33.7	30	1.4	90	4.1	150	6.9
31	6 52.8	6 53.9	6 33.9	31	1.4	91	4.2	151	6.9
32	6 53.0	6 54.1	6 34.2	32	1.5	92	4.2	152	7.0
33	6 53.3	6 54.4	6 34.4	33	1.5	93	4.3	153	7.0
34	6 53.5	6 54.6	6 34.7	34	1.6	94	4.3	154	7.1
35	6 53.8	6 54.9	6 34.9	35	1.6	95	4.4	155	7.1
36	6 54.0	6 55.1	6 35.1	36	1.7	96	4.4	156	7.2
37	6 54.3	6 55.4	6 35.4	37	1.7	97	4.4	157	7.2
38	6 54.5	6 55.6	6 35.6	38	1.7	98	4.5	158	7.2
39	6 54.8	6 55.9	6 35.9	39	1.8	99	4.5	159	7.3
40	6 55.0	6 56.1	6 36.1	40	1.8	100	4.6	160	7.3
41	6 55.3	6 56.4	6 36.3	41	1.9	101	4.6	161	7.4
42	6 55.5	6 56.6	6 36.6	42	1.9	102	4.7	162	7.4
43	6 55.8	6 56.9	6 36.8	43	2.0	103	4.7	163	7.5
44	6 56.0	6 57.1	6 37.0	44	2.0	104	4.8	164	7.5
45	6 56.3	6 57.4	6 37.3	45	2.1	105	4.8	165	7.6
46	6 56.5	6 57.6	6 37.5	46	2.1	106	4.9	166	7.6
47	6 56.8	6 57.9	6 37.8	47	2.2	107	4.9	167	7.7
48	6 57.0	6 58.1	6 38.0	48	2.2	108	5.0	168	7.7
49	6 57.3	6 58.4	6 38.2	49	2.2	109	5.0	169	7.7
50	6 57.5	6 58.6	6 38.5	50	2.3	110	5.0	170	7.8
51	6 57.8	6 58.9	6 38.7	51	2.3	111	5.1	171	7.8
52	6 58.0	6 59.1	6 39.0	52	2.4	112	5.1	172	7.9
53	6 58.3	6 59.4	6 39.2	53	2.4	113	5.2	173	7.9
54	6 58.5	6 59.6	6 39.4	54	2.5	114	5.2	174	8.0
55	6 58.8	6 59.9	6 39.7	55	2.5	115	5.3	175	8.0
56	6 59.0	7 00.1	6 39.9	56	2.6	116	5.3	176	8.1
57	6 59.3	7 00.4	6 40.2	57	2.6	117	5.4	177	8.1
58	6 59.5	7 00.6	6 40.4	58	2.7	118	5.4	178	8.2
59	6 59.8	7 00.9	6 40.6	59	2.7	119	5.5	179	8.2
60	7 00.0	7 01.1	6 40.9	60	2.8	120	5.5	180	8.3

28m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	7 00.0	7 01.1	6 40.9	0	0.0	60	2.9	120	5.7
1	7 00.3	7 01.4	6 41.1	1	0.0	61	2.9	121	5.7
2	7 00.5	7 01.7	6 41.3	2	0.1	62	2.9	122	5.8
3	7 00.8	7 01.9	6 41.6	3	0.1	63	3.0	123	5.8
4	7 01.0	7 02.2	6 41.8	4	0.2	64	3.0	124	5.9
5	7 01.3	7 02.4	6 42.1	5	0.2	65	3.1	125	5.9
6	7 01.5	7 02.7	6 42.3	6	0.3	66	3.1	126	6.0
7	7 01.8	7 02.9	6 42.5	7	0.3	67	3.2	127	6.0
8	7 02.0	7 03.2	6 42.8	8	0.4	68	3.2	128	6.1
9	7 02.3	7 03.4	6 43.0	9	0.4	69	3.3	129	6.1
10	7 02.5	7 03.7	6 43.3	10	0.5	70	3.3	130	6.2
11	7 02.8	7 03.9	6 43.5	11	0.5	71	3.4	131	6.2
12	7 03.0	7 04.2	6 43.7	12	0.6	72	3.4	132	6.3
13	7 03.3	7 04.4	6 44.0	13	0.6	73	3.5	133	6.3
14	7 03.5	7 04.7	6 44.2	14	0.7	74	3.5	134	6.4
15	7 03.8	7 04.9	6 44.4	15	0.7	75	3.6	135	6.4
16	7 04.0	7 05.2	6 44.7	16	0.8	76	3.6	136	6.5
17	7 04.3	7 05.4	6 44.9	17	0.8	77	3.7	137	6.5
18	7 04.5	7 05.7	6 45.2	18	0.9	78	3.7	138	6.6
19	7 04.8	7 05.9	6 45.4	19	0.9	79	3.8	139	6.6
20	7 05.0	7 06.2	6 45.6	20	1.0	80	3.8	140	6.7
21	7 05.3	7 06.4	6 45.9	21	1.0	81	3.8	141	6.7
22	7 05.5	7 06.7	6 46.1	22	1.0	82	3.9	142	6.7
23	7 05.8	7 06.9	6 46.4	23	1.1	83	3.9	143	6.8
24	7 06.0	7 07.2	6 46.6	24	1.1	84	4.0	144	6.8
25	7 06.3	7 07.4	6 46.8	25	1.2	85	4.0	145	6.9
26	7 06.5	7 07.7	6 47.1	26	1.2	86	4.1	146	6.9
27	7 06.8	7 07.9	6 47.3	27	1.3	87	4.1	147	7.0
28	7 07.0	7 08.2	6 47.5	28	1.3	88	4.2	148	7.0
29	7 07.3	7 08.4	6 47.8	29	1.4	89	4.2	149	7.1
30	7 07.5	7 08.7	6 48.0	30	1.4	90	4.3	150	7.1
31	7 07.8	7 08.9	6 48.3	31	1.5	91	4.3	151	7.2
32	7 08.0	7 09.2	6 48.5	32	1.5	92	4.4	152	7.2
33	7 08.3	7 09.4	6 48.7	33	1.6	93	4.4	153	7.3
34	7 08.5	7 09.7	6 49.0	34	1.6	94	4.5	154	7.3
35	7 08.8	7 09.9	6 49.2	35	1.7	95	4.5	155	7.4
36	7 09.0	7 10.2	6 49.5	36	1.7	96	4.6	156	7.4
37	7 09.3	7 10.4	6 49.7	37	1.8	97	4.6	157	7.5
38	7 09.5	7 10.7	6 49.9	38	1.8	98	4.7	158	7.5
39	7 09.8	7 10.9	6 50.2	39	1.9	99	4.7	159	7.6
40	7 10.0	7 11.2	6 50.4	40	1.9	100	4.8	160	7.6
41	7 10.3	7 11.4	6 50.6	41	1.9	101	4.8	161	7.6
42	7 10.5	7 11.7	6 50.9	42	2.0	102	4.8	162	7.7
43	7 10.8	7 11.9	6 51.1	43	2.0	103	4.9	163	7.7
44	7 11.0	7 12.2	6 51.4	44	2.1	104	4.9	164	7.8
45	7 11.3	7 12.4	6 51.6	45	2.1	105	5.0	165	7.8
46	7 11.5	7 12.7	6 51.8	46	2.2	106	5.0	166	7.9
47	7 11.8	7 12.9	6 52.1	47	2.2	107	5.1	167	7.9
48	7 12.0	7 13.2	6 52.3	48	2.3	108	5.1	168	8.0
49	7 12.3	7 13.4	6 52.6	49	2.3	109	5.2	169	8.0
50	7 12.5	7 13.7	6 52.8	50	2.4	110	5.2	170	8.1
51	7 12.8	7 13.9	6 53.0	51	2.4	111	5.3	171	8.1
52	7 13.0	7 14.2	6 53.3	52	2.5	112	5.3	172	8.2
53	7 13.3	7 14.4	6 53.5	53	2.5	113	5.4	173	8.2
54	7 13.5	7 14.7	6 53.8	54	2.6	114	5.4	174	8.3
55	7 13.8	7 14.9	6 54.0	55	2.6	115	5.5	175	8.3
56	7 14.0	7 15.2	6 54.2	56	2.7	116	5.5	176	8.4
57	7 14.3	7 15.4	6 54.5	57	2.7	117	5.6	177	8.4
58	7 14.5	7 15.7	6 54.7	58	2.8	118	5.6	178	8.5
59	7 14.8	7 15.9	6 54.9	59	2.8	119	5.7	179	8.5
60	7 15.0	7 16.2	6 55.2	60	2.9	120	5.7	180	8.6

29m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	7 15.0	7 16.2	6 55.2	0	0.0	60	3.0	120	5.9
1	7 15.3	7 16.4	6 55.4	1	0.0	61	3.0	121	5.9
2	7 15.5	7 16.7	6 55.7	2	0.1	62	3.0	122	6.0
3	7 15.8	7 16.9	6 55.9	3	0.1	63	3.1	123	6.0
4	7 16.0	7 17.2	6 56.1	4	0.2	64	3.1	124	6.1
5	7 16.3	7 17.4	6 56.4	5	0.2	65	3.2	125	6.1
6	7 16.5	7 17.7	6 56.6	6	0.3	66	3.2	126	6.2
7	7 16.8	7 17.9	6 56.9	7	0.3	67	3.3	127	6.2
8	7 17.0	7 18.2	6 57.1	8	0.4	68	3.3	128	6.3
9	7 17.3	7 18.4	6 57.3	9	0.4	69	3.4	129	6.3
10	7 17.5	7 18.7	6 57.6	10	0.5	70	3.4	130	6.4
11	7 17.8	7 18.9	6 57.8	11	0.5	71	3.5	131	6.4
12	7 18.0	7 19.2	6 58.0	12	0.6	72	3.5	132	6.5
13	7 18.3	7 19.4	6 58.3	13	0.6	73	3.6	133	6.5
14	7 18.5	7 19.7	6 58.5	14	0.7	74	3.6	134	6.6
15	7 18.8	7 20.0	6 58.8	15	0.7	75	3.7	135	6.6
16	7 19.0	7 20.2	6 59.0	16	0.8	76	3.7	136	6.7
17	7 19.3	7 20.5	6 59.2	17	0.8	77	3.8	137	6.7
18	7 19.5	7 20.7	6 59.5	18	0.9	78	3.8	138	6.8
19	7 19.8	7 21.0	6 59.7	19	0.9	79	3.9	139	6.8
20	7 20.0	7 21.2	7 00.0	20	1.0	80	3.9	140	6.9
21	7 20.3	7 21.5	7 00.2	21	1.0	81	4.0	141	6.9
22	7 20.5	7 21.7	7 00.4	22	1.1	82	4.0	142	7.0
23	7 20.8	7 22.0	7 00.7	23	1.1	83	4.1	143	7.0
24	7 21.0	7 22.2	7 00.9	24	1.2	84	4.1	144	7.1
25	7 21.3	7 22.5	7 01.1	25	1.2	85	4.2	145	7.1
26	7 21.5	7 22.7	7 01.4	26	1.3	86	4.2	146	7.2
27	7 21.8	7 23.0	7 01.6	27	1.3	87	4.3	147	7.2
28	7 22.0	7 23.2	7 01.9	28	1.4	88	4.3	148	7.3
29	7 22.3	7 23.5	7 02.1	29	1.4	89	4.4	149	7.3
30	7 22.5	7 23.7	7 02.3	30	1.5	90	4.4	150	7.4
31	7 22.8	7 24.0	7 02.6	31	1.5	91	4.5	151	7.4
32	7 23.0	7 24.2	7 02.8	32	1.6	92	4.5	152	7.5
33	7 23.3	7 24.5	7 03.1	33	1.6	93	4.6	153	7.5
34	7 23.5	7 24.7	7 03.3	34	1.7	94	4.6	154	7.6
35	7 23.8	7 25.0	7 03.5	35	1.7	95	4.7	155	7.6
36	7 24.0	7 25.2	7 03.8	36	1.8	96	4.7	156	7.7
37	7 24.3	7 25.5	7 04.0	37	1.8	97	4.8	157	7.7
38	7 24.5	7 25.7	7 04.3	38	1.9	98	4.8	158	7.8
39	7 24.8	7 26.0	7 04.5	39	1.9	99	4.9	159	7.8
40	7 25.0	7 26.2	7 04.7	40	2.0	100	4.9	160	7.9
41	7 25.3	7 26.5	7 05.0	41	2.0	101	5.0	161	7.9
42	7 25.5	7 26.7	7 05.2	42	2.1	102	5.0	162	8.0
43	7 25.8	7 27.0	7 05.4	43	2.1	103	5.1	163	8.0
44	7 26.0	7 27.2	7 05.7	44	2.2	104	5.1	164	8.1
45	7 26.3	7 27.5	7 05.9	45	2.2	105	5.2	165	8.1
46	7 26.5	7 27.7	7 06.2	46	2.3	106	5.2	166	8.2
47	7 26.8	7 28.0	7 06.4	47	2.3	107	5.3	167	8.2
48	7 27.0	7 28.2	7 06.6	48	2.4	108	5.3	168	8.3
49	7 27.3	7 28.5	7 06.9	49	2.4	109	5.4	169	8.3
50	7 27.5	7 28.7	7 07.1	50	2.5	110	5.4	170	8.4
51	7 27.8	7 29.0	7 07.4	51	2.5	111	5.5	171	8.4
52	7 28.0	7 29.2	7 07.6	52	2.6	112	5.5	172	8.5
53	7 28.3	7 29.5	7 07.8	53	2.6	113	5.6	173	8.5
54	7 28.5	7 29.7	7 08.1	54	2.7	114	5.6	174	8.6
55	7 28.8	7 30.0	7 08.3	55	2.7	115	5.7	175	8.6
56	7 29.0	7 30.2	7 08.5	56	2.8	116	5.7	176	8.7
57	7 29.3	7 30.5	7 08.8	57	2.8	117	5.8	177	8.7
58	7 29.5	7 30.7	7 09.0	58	2.9	118	5.8	178	8.8
59	7 29.8	7 31.0	7 09.3	59	2.9	119	5.9	179	8.8
60	7 30.0	7 31.2	7 09.5	60	3.0	120	5.9	180	8.9

30^m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	7 30.0	7 31.2	7 09.5	0	0.0	60	3.1	120	6.1
1	7 30.3	7 31.5	7 09.7	1	0.1	61	3.1	121	6.2
2	7 30.5	7 31.7	7 10.0	2	0.1	62	3.2	122	6.2
3	7 30.8	7 32.0	7 10.2	3	0.2	63	3.2	123	6.3
4	7 31.0	7 32.2	7 10.5	4	0.2	64	3.3	124	6.3
5	7 31.3	7 32.5	7 10.7	5	0.3	65	3.3	125	6.4
6	7 31.5	7 32.7	7 10.9	6	0.3	66	3.4	126	6.4
7	7 31.8	7 33.0	7 11.2	7	0.4	67	3.4	127	6.5
8	7 32.0	7 33.2	7 11.4	8	0.4	68	3.5	128	6.5
9	7 32.3	7 33.5	7 11.6	9	0.5	69	3.5	129	6.6
10	7 32.5	7 33.7	7 11.9	10	0.5	70	3.6	130	6.6
11	7 32.8	7 34.0	7 12.1	11	0.6	71	3.6	131	6.7
12	7 33.0	7 34.2	7 12.4	12	0.6	72	3.7	132	6.7
13	7 33.3	7 34.5	7 12.6	13	0.7	73	3.7	133	6.8
14	7 33.5	7 34.7	7 12.8	14	0.7	74	3.8	134	6.8
15	7 33.8	7 35.0	7 13.1	15	0.8	75	3.8	135	6.9
16	7 34.0	7 35.2	7 13.3	16	0.8	76	3.9	136	6.9
17	7 34.3	7 35.5	7 13.6	17	0.9	77	3.9	137	7.0
18	7 34.5	7 35.7	7 13.8	18	0.9	78	4.0	138	7.0
19	7 34.8	7 36.0	7 14.0	19	1.0	79	4.0	139	7.1
20	7 35.0	7 36.2	7 14.3	20	1.0	80	4.1	140	7.1
21	7 35.3	7 36.5	7 14.5	21	1.1	81	4.1	141	7.2
22	7 35.5	7 36.7	7 14.7	22	1.1	82	4.2	142	7.2
23	7 35.8	7 37.0	7 15.0	23	1.2	83	4.2	143	7.3
24	7 36.0	7 37.2	7 15.2	24	1.2	84	4.3	144	7.3
25	7 36.3	7 37.5	7 15.5	25	1.3	85	4.3	145	7.4
26	7 36.5	7 37.7	7 15.7	26	1.3	86	4.4	146	7.4
27	7 36.8	7 38.0	7 15.9	27	1.4	87	4.4	147	7.5
28	7 37.0	7 38.3	7 16.2	28	1.4	88	4.5	148	7.5
29	7 37.3	7 38.5	7 16.4	29	1.5	89	4.5	149	7.6
30	7 37.5	7 38.8	7 16.7	30	1.5	90	4.6	150	7.6
31	7 37.8	7 39.0	7 16.9	31	1.6	91	4.6	151	7.7
32	7 38.0	7 39.3	7 17.1	32	1.6	92	4.7	152	7.7
33	7 38.3	7 39.5	7 17.4	33	1.7	93	4.7	153	7.8
34	7 38.5	7 39.8	7 17.6	34	1.7	94	4.8	154	7.8
35	7 38.8	7 40.0	7 17.9	35	1.8	95	4.8	155	7.9
36	7 39.0	7 40.3	7 18.1	36	1.8	96	4.9	156	7.9
37	7 39.3	7 40.5	7 18.3	37	1.9	97	4.9	157	8.0
38	7 39.5	7 40.8	7 18.6	38	1.9	98	5.0	158	8.0
39	7 39.8	7 41.0	7 18.8	39	2.0	99	5.0	159	8.1
40	7 40.0	7 41.3	7 19.0	40	2.0	100	5.1	160	8.1
41	7 40.3	7 41.5	7 19.3	41	2.1	101	5.1	161	8.2
42	7 40.5	7 41.8	7 19.5	42	2.1	102	5.2	162	8.2
43	7 40.8	7 42.0	7 19.8	43	2.2	103	5.2	163	8.3
44	7 41.0	7 42.3	7 20.0	44	2.2	104	5.3	164	8.3
45	7 41.3	7 42.5	7 20.2	45	2.3	105	5.3	165	8.4
46	7 41.5	7 42.8	7 20.5	46	2.3	106	5.4	166	8.4
47	7 41.8	7 43.0	7 20.7	47	2.4	107	5.4	167	8.5
48	7 42.0	7 43.3	7 21.0	48	2.4	108	5.5	168	8.5
49	7 42.3	7 43.5	7 21.2	49	2.5	109	5.5	169	8.6
50	7 42.5	7 43.8	7 21.4	50	2.5	110	5.6	170	8.6
51	7 42.8	7 44.0	7 21.7	51	2.6	111	5.6	171	8.7
52	7 43.0	7 44.3	7 21.9	52	2.6	112	5.7	172	8.7
53	7 43.3	7 44.5	7 22.1	53	2.7	113	5.7	173	8.8
54	7 43.5	7 44.8	7 22.4	54	2.7	114	5.8	174	8.8
55	7 43.8	7 45.0	7 22.6	55	2.8	115	5.8	175	8.9
56	7 44.0	7 45.3	7 22.9	56	2.8	116	5.9	176	8.9
57	7 44.3	7 45.5	7 23.1	57	2.9	117	5.9	177	9.0
58	7 44.5	7 45.8	7 23.3	58	2.9	118	6.0	178	9.0
59	7 44.8	7 46.0	7 23.6	59	3.0	119	6.0	179	9.1
60	7 45.0	7 46.3	7 23.8	60	3.1	120	6.1	180	9.2

31^m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	7 45.0	7 46.3	7 23.8	0	0.0	60	3.2	120	6.3
1	7 45.3	7 46.5	7 24.1	1	0.1	61	3.2	121	6.4
2	7 45.5	7 46.8	7 24.3	2	0.1	62	3.3	122	6.4
3	7 45.8	7 47.0	7 24.5	3	0.2	63	3.3	123	6.5
4	7 46.0	7 47.3	7 24.8	4	0.2	64	3.4	124	6.5
5	7 46.3	7 47.5	7 25.0	5	0.3	65	3.4	125	6.6
6	7 46.5	7 47.8	7 25.2	6	0.3	66	3.5	126	6.6
7	7 46.8	7 48.0	7 25.5	7	0.4	67	3.5	127	6.7
8	7 47.0	7 48.3	7 25.7	8	0.4	68	3.6	128	6.7
9	7 47.3	7 48.5	7 26.0	9	0.5	69	3.6	129	6.8
10	7 47.5	7 48.8	7 26.2	10	0.5	70	3.7	130	6.8
11	7 47.8	7 49.0	7 26.4	11	0.6	71	3.7	131	6.9
12	7 48.0	7 49.3	7 26.7	12	0.6	72	3.8	132	6.9
13	7 48.3	7 49.5	7 26.9	13	0.7	73	3.8	133	7.0
14	7 48.5	7 49.8	7 27.2	14	0.7	74	3.9	134	7.0
15	7 48.8	7 50.0	7 27.4	15	0.8	75	3.9	135	7.1
16	7 49.0	7 50.3	7 27.6	16	0.8	76	4.0	136	7.1
17	7 49.3	7 50.5	7 27.9	17	0.9	77	4.0	137	7.2
18	7 49.5	7 50.8	7 28.1	18	0.9	78	4.1	138	7.2
19	7 49.8	7 51.0	7 28.4	19	1.0	79	4.1	139	7.3
20	7 50.0	7 51.3	7 28.6	20	1.1	80	4.2	140	7.4
21	7 50.3	7 51.5	7 28.8	21	1.1	81	4.3	141	7.4
22	7 50.5	7 51.8	7 29.1	22	1.2	82	4.3	142	7.5
23	7 50.8	7 52.0	7 29.3	23	1.2	83	4.4	143	7.5
24	7 51.0	7 52.3	7 29.5	24	1.3	84	4.4	144	7.6
25	7 51.3	7 52.5	7 29.8	25	1.3	85	4.5	145	7.6
26	7 51.5	7 52.8	7 30.0	26	1.4	86	4.5	146	7.7
27	7 51.8	7 53.0	7 30.3	27	1.4	87	4.6	147	7.7
28	7 52.0	7 53.3	7 30.5	28	1.5	88	4.6	148	7.8
29	7 52.3	7 53.5	7 30.7	29	1.5	89	4.7	149	7.8
30	7 52.5	7 53.8	7 31.0	30	1.6	90	4.7	150	7.9
31	7 52.8	7 54.0	7 31.2	31	1.6	91	4.8	151	7.9
32	7 53.0	7 54.3	7 31.5	32	1.7	92	4.8	152	8.0
33	7 53.3	7 54.5	7 31.7	33	1.7	93	4.9	153	8.0
34	7 53.5	7 54.8	7 31.9	34	1.8	94	4.9	154	8.1
35	7 53.8	7 55.0	7 32.2	35	1.8	95	5.0	155	8.1
36	7 54.0	7 55.3	7 32.4	36	1.9	96	5.0	156	8.2
37	7 54.3	7 55.5	7 32.6	37	1.9	97	5.1	157	8.2
38	7 54.5	7 55.8	7 32.9	38	2.0	98	5.1	158	8.3
39	7 54.8	7 56.0	7 33.1	39	2.0	99	5.2	159	8.3
40	7 55.0	7 56.3	7 33.4	40	2.1	100	5.3	160	8.4
41	7 55.3	7 56.6	7 33.6	41	2.2	101	5.3	161	8.5
42	7 55.5	7 56.8	7 33.8	42	2.2	102	5.4	162	8.5
43	7 55.8	7 57.1	7 34.1	43	2.3	103	5.4	163	8.6
44	7 56.0	7 57.3	7 34.3	44	2.3	104	5.5	164	8.6
45	7 56.3	7 57.6	7 34.6	45	2.4	105	5.5	165	8.7
46	7 56.5	7 57.8	7 34.8	46	2.4	106	5.6	166	8.7
47	7 56.8	7 58.1	7 35.0	47	2.5	107	5.6	167	8.8
48	7 57.0	7 58.3	7 35.3	48	2.5	108	5.7	168	8.8
49	7 57.3	7 58.6	7 35.5	49	2.6	109	5.7	169	8.9
50	7 57.5	7 58.8	7 35.7	50	2.6	110	5.8	170	8.9
51	7 57.8	7 59.1	7 36.0	51	2.7	111	5.8	171	9.0
52	7 58.0	7 59.3	7 36.2	52	2.7	112	5.9	172	9.0
53	7 58.3	7 59.6	7 36.5	53	2.8	113	5.9	173	9.1
54	7 58.5	7 59.8	7 36.7	54	2.8	114	6.0	174	9.1
55	7 58.8	8 00.1	7 36.9	55	2.9	115	6.0	175	9.2
56	7 59.0	8 00.3	7 37.2	56	2.9	116	6.1	176	9.2
57	7 59.3	8 00.6	7 37.4	57	3.0	117	6.1	177	9.3
58	7 59.5	8 00.8	7 37.7	58	3.0	118	6.2	178	9.3
59	7 59.8	8 01.1	7 37.9	59	3.1	119	6.2	179	9.4
60	8 00.0	8 01.3	7 38.1	60	3.2	120	6.3	180	9.5

992941°—53——17

32m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	8 00.0	8 01.3	7 38.1	0	0.0	60	3.3	120	6.5
1	8 00.3	8 01.6	7 38.4	1	0.1	61	3.3	121	6.6
2	8 00.5	8 01.8	7 38.6	2	0.1	62	3.4	122	6.6
3	8 00.8	8 02.1	7 38.8	3	0.2	63	3.4	123	6.7
4	8 01.0	8 02.3	7 39.1	4	0.2	64	3.5	124	6.7
5	8 01.3	8 02.6	7 39.3	5	0.3	65	3.5	125	6.8
6	8 01.5	8 02.8	7 39.6	6	0.3	66	3.6	126	6.8
7	8 01.8	8 03.1	7 39.8	7	0.4	67	3.6	127	6.9
8	8 02.0	8 03.3	7 40.0	8	0.4	68	3.7	128	6.9
9	8 02.3	8 03.6	7 40.3	9	0.5	69	3.7	129	7.0
10	8 02.5	8 03.8	7 40.5	10	0.5	70	3.8	130	7.0
11	8 02.8	8 04.1	7 40.8	11	0.6	71	3.8	131	7.1
12	8 03.0	8 04.3	7 41.0	12	0.7	72	3.9	132	7.2
13	8 03.3	8 04.6	7 41.2	13	0.7	73	4.0	133	7.2
14	8 03.5	8 04.8	7 41.5	14	0.8	74	4.0	134	7.3
15	8 03.8	8 05.1	7 41.7	15	0.8	75	4.1	135	7.3
16	8 04.0	8 05.3	7 42.0	16	0.9	76	4.1	136	7.4
17	8 04.3	8 05.6	7 42.2	17	0.9	77	4.2	137	7.4
18	8 04.5	8 05.8	7 42.4	18	1.0	78	4.2	138	7.5
19	8 04.8	8 06.1	7 42.7	19	1.0	79	4.3	139	7.5
20	8 05.0	8 06.3	7 42.9	20	1.1	80	4.3	140	7.6
21	8 05.3	8 06.6	7 43.1	21	1.1	81	4.4	141	7.6
22	8 05.5	8 06.8	7 43.4	22	1.2	82	4.4	142	7.7
23	8 05.8	8 07.1	7 43.6	23	1.2	83	4.5	143	7.7
24	8 06.0	8 07.3	7 43.9	24	1.3	84	4.6	144	7.8
25	8 06.3	8 07.6	7 44.1	25	1.4	85	4.6	145	7.9
26	8 06.5	8 07.8	7 44.3	26	1.4	86	4.7	146	7.9
27	8 06.8	8 08.1	7 44.6	27	1.5	87	4.7	147	8.0
28	8 07.0	8 08.3	7 44.8	28	1.5	88	4.8	148	8.0
29	8 07.3	8 08.6	7 45.1	29	1.6	89	4.8	149	8.1
30	8 07.5	8 08.8	7 45.3	30	1.6	90	4.9	150	8.1
31	8 07.8	8 09.1	7 45.5	31	1.7	91	4.9	151	8.2
32	8 08.0	8 09.3	7 45.8	32	1.7	92	5.0	152	8.2
33	8 08.3	8 09.6	7 46.0	33	1.8	93	5.0	153	8.3
34	8 08.5	8 09.8	7 46.2	34	1.8	94	5.1	154	8.3
35	8 08.8	8 10.1	7 46.5	35	1.9	95	5.1	155	8.4
36	8 09.0	8 10.3	7 46.7	36	2.0	96	5.2	156	8.5
37	8 09.3	8 10.6	7 47.0	37	2.0	97	5.3	157	8.5
38	8 09.5	8 10.8	7 47.2	38	2.1	98	5.3	158	8.6
39	8 09.8	8 11.1	7 47.4	39	2.1	99	5.4	159	8.6
40	8 10.0	8 11.3	7 47.7	40	2.2	100	5.4	160	8.7
41	8 10.3	8 11.6	7 47.9	41	2.2	101	5.5	161	8.7
42	8 10.5	8 11.8	7 48.2	42	2.3	102	5.5	162	8.8
43	8 10.8	8 12.1	7 48.4	43	2.3	103	5.6	163	8.8
44	8 11.0	8 12.3	7 48.6	44	2.4	104	5.6	164	8.9
45	8 11.3	8 12.6	7 48.9	45	2.4	105	5.7	165	8.9
46	8 11.5	8 12.8	7 49.1	46	2.5	106	5.7	166	9.0
47	8 11.8	8 13.1	7 49.3	47	2.5	107	5.8	167	9.0
48	8 12.0	8 13.3	7 49.6	48	2.6	108	5.9	168	9.1
49	8 12.3	8 13.6	7 49.8	49	2.7	109	5.9	169	9.2
50	8 12.5	8 13.8	7 50.1	50	2.7	110	6.0	170	9.2
51	8 12.8	8 14.1	7 50.3	51	2.8	111	6.0	171	9.3
52	8 13.0	8 14.3	7 50.5	52	2.8	112	6.1	172	9.3
53	8 13.3	8 14.6	7 50.8	53	2.9	113	6.1	173	9.4
54	8 13.5	8 14.9	7 51.0	54	2.9	114	6.2	174	9.4
55	8 13.8	8 15.1	7 51.3	55	3.0	115	6.2	175	9.5
56	8 14.0	8 15.4	7 51.5	56	3.0	116	6.3	176	9.5
57	8 14.3	8 15.6	7 51.7	57	3.1	117	6.3	177	9.6
58	8 14.5	8 15.9	7 52.0	58	3.1	118	6.4	178	9.6
59	8 14.8	8 16.1	7 52.2	59	3.2	119	6.4	179	9.7
60	8 15.0	8 16.4	7 52.5	60	3.3	120	6.5	180	9.8

33m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	8 15.0	8 16.4	7 52.5	0	0.0	60	3.4	120	6.7
1	8 15.3	8 16.6	7 52.7	1	0.1	61	3.4	121	6.8
2	8 15.5	8 16.9	7 52.9	2	0.1	62	3.5	122	6.8
3	8 15.8	8 17.1	7 53.2	3	0.2	63	3.5	123	6.9
4	8 16.0	8 17.4	7 53.4	4	0.2	64	3.6	124	6.9
5	8 16.3	8 17.6	7 53.6	5	0.3	65	3.6	125	7.0
6	8 16.5	8 17.9	7 53.9	6	0.3	66	3.7	126	7.0
7	8 16.8	8 18.1	7 54.1	7	0.4	67	3.7	127	7.1
8	8 17.0	8 18.4	7 54.4	8	0.4	68	3.8	128	7.1
9	8 17.3	8 18.6	7 54.6	9	0.5	69	3.9	129	7.2
10	8 17.5	8 18.9	7 54.8	10	0.6	70	3.9	130	7.3
11	8 17.8	8 19.1	7 55.1	11	0.6	71	4.0	131	7.3
12	8 18.0	8 19.4	7 55.3	12	0.7	72	4.0	132	7.4
13	8 18.3	8 19.6	7 55.6	13	0.7	73	4.1	133	7.4
14	8 18.5	8 19.9	7 55.8	14	0.8	74	4.1	134	7.5
15	8 18.8	8 20.1	7 56.0	15	0.8	75	4.2	135	7.5
16	8 19.0	8 20.4	7 56.3	16	0.9	76	4.2	136	7.6
17	8 19.3	8 20.6	7 56.5	17	0.9	77	4.3	137	7.6
18	8 19.5	8 20.9	7 56.7	18	1.0	78	4.4	138	7.7
19	8 19.8	8 21.1	7 57.0	19	1.1	79	4.4	139	7.8
20	8 20.0	8 21.4	7 57.2	20	1.1	80	4.5	140	7.8
21	8 20.3	8 21.6	7 57.5	21	1.2	81	4.5	141	7.9
22	8 20.5	8 21.9	7 57.7	22	1.2	82	4.6	142	7.9
23	8 20.8	8 22.1	7 57.9	23	1.3	83	4.6	143	8.0
24	8 21.0	8 22.4	7 58.2	24	1.3	84	4.7	144	8.0
25	8 21.3	8 22.6	7 58.4	25	1.4	85	4.7	145	8.1
26	8 21.5	8 22.9	7 58.7	26	1.5	86	4.8	146	8.2
27	8 21.8	8 23.1	7 58.9	27	1.5	87	4.9	147	8.2
28	8 22.0	8 23.4	7 59.1	28	1.6	88	4.9	148	8.3
29	8 22.3	8 23.6	7 59.4	29	1.6	89	5.0	149	8.3
30	8 22.5	8 23.9	7 59.6	30	1.7	90	5.0	150	8.4
31	8 22.8	8 24.1	7 59.8	31	1.7	91	5.1	151	8.4
32	8 23.0	8 24.4	8 00.1	32	1.8	92	5.1	152	8.5
33	8 23.3	8 24.6	8 00.3	33	1.8	93	5.2	153	8.5
34	8 23.5	8 24.9	8 00.6	34	1.9	94	5.2	154	8.6
35	8 23.8	8 25.1	8 00.8	35	2.0	95	5.3	155	8.7
36	8 24.0	8 25.4	8 01.0	36	2.0	96	5.4	156	8.7
37	8 24.3	8 25.6	8 01.3	37	2.1	97	5.4	157	8.8
38	8 24.5	8 25.9	8 01.5	38	2.1	98	5.5	158	8.8
39	8 24.8	8 26.1	8 01.8	39	2.2	99	5.5	159	8.9
40	8 25.0	8 26.4	8 02.0	40	2.2	100	5.6	160	8.9
41	8 25.3	8 26.6	8 02.2	41	2.3	101	5.6	161	9.0
42	8 25.5	8 26.9	8 02.5	42	2.3	102	5.7	162	9.0
43	8 25.8	8 27.1	8 02.7	43	2.4	103	5.8	163	9.1
44	8 26.0	8 27.4	8 02.9	44	2.5	104	5.8	164	9.2
45	8 26.3	8 27.6	8 03.2	45	2.5	105	5.9	165	9.2
46	8 26.5	8 27.9	8 03.4	46	2.6	106	5.9	166	9.3
47	8 26.8	8 28.1	8 03.7	47	2.6	107	6.0	167	9.3
48	8 27.0	8 28.4	8 03.9	48	2.7	108	6.0	168	9.4
49	8 27.3	8 28.6	8 04.1	49	2.7	109	6.1	169	9.4
50	8 27.5	8 28.9	8 04.4	50	2.8	110	6.1	170	9.5
51	8 27.8	8 29.1	8 04.6	51	2.8	111	6.2	171	9.5
52	8 28.0	8 29.4	8 04.9	52	2.9	112	6.3	172	9.6
53	8 28.3	8 29.6	8 05.1	53	3.0	113	6.3	173	9.7
54	8 28.5	8 29.9	8 05.3	54	3.0	114	6.4	174	9.7
55	8 28.8	8 30.1	8 05.6	55	3.1	115	6.4	175	9.8
56	8 29.0	8 30.4	8 05.8	56	3.1	116	6.5	176	9.8
57	8 29.3	8 30.6	8 06.1	57	3.2	117	6.5	177	9.9
58	8 29.5	8 30.9	8 06.3	58	3.2	118	6.6	178	9.9
59	8 29.8	8 31.1	8 06.5	59	3.3	119	6.6	179	10.0
60	8 30.0	8 31.4	8 06.8	60	3.4	120	6.7	180	10.1

34ᵐ

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	8 30.0	8 31.4	8 06.8	0	0.0	60	3.5	120	6.9
1	8 30.3	8 31.6	8 07.0	1	0.1	61	3.5	121	7.0
2	8 30.5	8 31.9	8 07.2	2	0.1	62	3.6	122	7.0
3	8 30.8	8 32.1	8 07.5	3	0.2	63	3.6	123	7.1
4	8 31.0	8 32.4	8 07.7	4	0.2	64	3.7	124	7.1
5	8 31.3	8 32.6	8 08.0	5	0.3	65	3.7	125	7.2
6	8 31.5	8 32.9	8 08.2	6	0.3	66	3.8	126	7.2
7	8 31.8	8 33.2	8 08.4	7	0.4	67	3.9	127	7.3
8	8 32.0	8 33.4	8 08.7	8	0.5	68	3.9	128	7.4
9	8 32.3	8 33.7	8 08.9	9	0.5	69	4.0	129	7.4
10	8 32.5	8 33.9	8 09.2	10	0.6	70	4.0	130	7.5
11	8 32.8	8 34.2	8 09.4	11	0.6	71	4.1	131	7.5
12	8 33.0	8 34.4	8 09.6	12	0.7	72	4.1	132	7.6
13	8 33.3	8 34.7	8 09.9	13	0.7	73	4.2	133	7.6
14	8 33.5	8 34.9	8 10.1	14	0.8	74	4.3	134	7.7
15	8 33.8	8 35.2	8 10.3	15	0.9	75	4.3	135	7.8
16	8 34.0	8 35.4	8 10.6	16	0.9	76	4.4	136	7.8
17	8 34.3	8 35.7	8 10.8	17	1.0	77	4.4	137	7.9
18	8 34.5	8 35.9	8 11.1	18	1.0	78	4.5	138	7.9
19	8 34.8	8 36.2	8 11.3	19	1.1	79	4.5	139	8.0
20	8 35.0	8 36.4	8 11.5	20	1.2	80	4.6	140	8.1
21	8 35.3	8 36.7	8 11.8	21	1.2	81	4.7	141	8.1
22	8 35.5	8 36.9	8 12.0	22	1.3	82	4.7	142	8.2
23	8 35.8	8 37.2	8 12.3	23	1.3	83	4.8	143	8.2
24	8 36.0	8 37.4	8 12.5	24	1.4	84	4.8	144	8.3
25	8 36.3	8 37.7	8 12.7	25	1.4	85	4.9	145	8.3
26	8 36.5	8 37.9	8 13.0	26	1.5	86	4.9	146	8.4
27	8 36.8	8 38.2	8 13.2	27	1.6	87	5.0	147	8.5
28	8 37.0	8 38.4	8 13.4	28	1.6	88	5.1	148	8.5
29	8 37.3	8 38.7	8 13.7	29	1.7	89	5.1	149	8.6
30	8 37.5	8 38.9	8 13.9	30	1.7	90	5.2	150	8.6
31	8 37.8	8 39.2	8 14.2	31	1.8	91	5.2	151	8.7
32	8 38.0	8 39.4	8 14.4	32	1.8	92	5.3	152	8.7
33	8 38.3	8 39.7	8 14.6	33	1.9	93	5.3	153	8.8
34	8 38.5	8 39.9	8 14.9	34	2.0	94	5.4	154	8.9
35	8 38.8	8 40.2	8 15.1	35	2.0	95	5.5	155	8.9
36	8 39.0	8 40.4	8 15.4	36	2.1	96	5.5	156	9.0
37	8 39.3	8 40.7	8 15.6	37	2.1	97	5.6	157	9.0
38	8 39.5	8 40.9	8 15.8	38	2.2	98	5.6	158	9.1
39	8 39.8	8 41.2	8 16.1	39	2.2	99	5.7	159	9.1
40	8 40.0	8 41.4	8 16.3	40	2.3	100	5.8	160	9.2
41	8 40.3	8 41.7	8 16.5	41	2.4	101	5.8	161	9.3
42	8 40.5	8 41.9	8 16.8	42	2.4	102	5.9	162	9.3
43	8 40.8	8 42.2	8 17.0	43	2.5	103	5.9	163	9.4
44	8 41.0	8 42.4	8 17.3	44	2.5	104	6.0	164	9.4
45	8 41.3	8 42.7	8 17.5	45	2.6	105	6.0	165	9.5
46	8 41.5	8 42.9	8 17.7	46	2.6	106	6.1	166	9.5
47	8 41.8	8 43.2	8 18.0	47	2.7	107	6.2	167	9.6
48	8 42.0	8 43.4	8 18.2	48	2.8	108	6.2	168	9.7
49	8 42.3	8 43.7	8 18.5	49	2.8	109	6.3	169	9.7
50	8 42.5	8 43.9	8 18.7	50	2.9	110	6.3	170	9.8
51	8 42.8	8 44.2	8 18.9	51	2.9	111	6.4	171	9.8
52	8 43.0	8 44.4	8 19.2	52	3.0	112	6.4	172	9.9
53	8 43.3	8 44.7	8 19.4	53	3.0	113	6.5	173	9.9
54	8 43.5	8 44.9	8 19.7	54	3.1	114	6.6	174	10.0
55	8 43.8	8 45.2	8 19.9	55	3.2	115	6.6	175	10.1
56	8 44.0	8 45.4	8 20.1	56	3.2	116	6.7	176	10.1
57	8 44.3	8 45.7	8 20.4	57	3.3	117	6.7	177	10.2
58	8 44.5	8 45.9	8 20.6	58	3.3	118	6.8	178	10.2
59	8 44.8	8 46.2	8 20.8	59	3.4	119	6.8	179	10.3
60	8 45.0	8 46.4	8 21.1	60	3.5	120	6.9	180	10.4

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Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	8 45.0	8 46.4	8 21.1	0	0.0	60	3.6	120	7.1
1	8 45.3	8 46.7	8 21.3	1	0.1	61	3.6	121	7.2
2	8 45.5	8 46.9	8 21.6	2	0.1	62	3.7	122	7.2
3	8 45.8	8 47.2	8 21.8	3	0.2	63	3.7	123	7.3
4	8 46.0	8 47.4	8 22.0	4	0.2	64	3.8	124	7.3
5	8 46.3	8 47.7	8 22.3	5	0.3	65	3.8	125	7.4
6	8 46.5	8 47.9	8 22.5	6	0.4	66	3.9	126	7.5
7	8 46.8	8 48.2	8 22.8	7	0.4	67	4.0	127	7.5
8	8 47.0	8 48.4	8 23.0	8	0.5	68	4.0	128	7.6
9	8 47.3	8 48.7	8 23.2	9	0.5	69	4.1	129	7.6
10	8 47.5	8 48.9	8 23.5	10	0.6	70	4.1	130	7.7
11	8 47.8	8 49.2	8 23.7	11	0.7	71	4.2	131	7.8
12	8 48.0	8 49.4	8 23.9	12	0.7	72	4.3	132	7.8
13	8 48.3	8 49.7	8 24.2	13	0.8	73	4.3	133	7.9
14	8 48.5	8 49.9	8 24.4	14	0.8	74	4.4	134	7.9
15	8 48.8	8 50.2	8 24.7	15	0.9	75	4.4	135	8.0
16	8 49.0	8 50.4	8 24.9	16	0.9	76	4.5	136	8.0
17	8 49.3	8 50.7	8 25.1	17	1.0	77	4.6	137	8.1
18	8 49.5	8 50.9	8 25.4	18	1.1	78	4.6	138	8.2
19	8 49.8	8 51.2	8 25.6	19	1.1	79	4.7	139	8.2
20	8 50.0	8 51.5	8 25.9	20	1.2	80	4.7	140	8.3
21	8 50.3	8 51.7	8 26.1	21	1.2	81	4.8	141	8.3
22	8 50.5	8 52.0	8 26.3	22	1.3	82	4.9	142	8.4
23	8 50.8	8 52.2	8 26.6	23	1.4	83	4.9	143	8.5
24	8 51.0	8 52.5	8 26.8	24	1.4	84	5.0	144	8.5
25	8 51.3	8 52.7	8 27.0	25	1.5	85	5.0	145	8.6
26	8 51.5	8 53.0	8 27.3	26	1.5	86	5.1	146	8.6
27	8 51.8	8 53.2	8 27.5	27	1.6	87	5.1	147	8.7
28	8 52.0	8 53.5	8 27.8	28	1.7	88	5.2	148	8.8
29	8 52.3	8 53.7	8 28.0	29	1.7	89	5.3	149	8.8
30	8 52.5	8 54.0	8 28.2	30	1.8	90	5.3	150	8.9
31	8 52.8	8 54.2	8 28.5	31	1.8	91	5.4	151	8.9
32	8 53.0	8 54.5	8 28.7	32	1.9	92	5.4	152	9.0
33	8 53.3	8 54.7	8 29.0	33	2.0	93	5.5	153	9.1
34	8 53.5	8 55.0	8 29.2	34	2.0	94	5.6	154	9.1
35	8 53.8	8 55.2	8 29.4	35	2.1	95	5.6	155	9.2
36	8 54.0	8 55.5	8 29.7	36	2.1	96	5.7	156	9.2
37	8 54.3	8 55.7	8 29.9	37	2.2	97	5.7	157	9.3
38	8 54.5	8 56.0	8 30.2	38	2.2	98	5.8	158	9.3
39	8 54.8	8 56.2	8 30.4	39	2.3	99	5.9	159	9.4
40	8 55.0	8 56.5	8 30.6	40	2.4	100	5.9	160	9.5
41	8 55.3	8 56.7	8 30.9	41	2.4	101	6.0	161	9.5
42	8 55.5	8 57.0	8 31.1	42	2.5	102	6.0	162	9.6
43	8 55.8	8 57.2	8 31.3	43	2.5	103	6.1	163	9.6
44	8 56.0	8 57.5	8 31.6	44	2.6	104	6.2	164	9.7
45	8 56.3	8 57.7	8 31.8	45	2.7	105	6.2	165	9.8
46	8 56.5	8 58.0	8 32.1	46	2.7	106	6.3	166	9.8
47	8 56.8	8 58.2	8 32.3	47	2.8	107	6.3	167	9.9
48	8 57.0	8 58.5	8 32.5	48	2.8	108	6.4	168	9.9
49	8 57.3	8 58.7	8 32.8	49	2.9	109	6.4	169	10.0
50	8 57.5	8 59.0	8 33.0	50	3.0	110	6.5	170	10.1
51	8 57.8	8 59.2	8 33.3	51	3.0	111	6.6	171	10.1
52	8 58.0	8 59.5	8 33.5	52	3.1	112	6.6	172	10.2
53	8 58.3	8 59.7	8 33.7	53	3.1	113	6.7	173	10.2
54	8 58.5	9 00.0	8 34.0	54	3.2	114	6.7	174	10.3
55	8 58.8	9 00.2	8 34.2	55	3.3	115	6.8	175	10.4
56	8 59.0	9 00.5	8 34.4	56	3.3	116	6.9	176	10.4
57	8 59.3	9 00.7	8 34.7	57	3.4	117	6.9	177	10.5
58	8 59.5	9 01.0	8 34.9	58	3.4	118	7.0	178	10.5
59	8 59.8	9 01.2	8 35.2	59	3.5	119	7.0	179	10.6
60	9 00.0	9 01.5	8 35.4	60	3.6	120	7.1	180	10.7

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Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	9 00.0	9 01.5	8 35.4	0	0.0	60	3.7	120	7.3
1	9 00.3	9 01.7	8 35.6	1	0.1	61	3.7	121	7.4
2	9 00.5	9 02.0	8 35.9	2	0.1	62	3.8	122	7.4
3	9 00.8	9 02.2	8 36.1	3	0.2	63	3.8	123	7.5
4	9 01.0	9 02.5	8 36.4	4	0.2	64	3.9	124	7.5
5	9 01.3	9 02.7	8 36.6	5	0.3	65	4.0	125	7.6
6	9 01.5	9 03.0	8 36.8	6	0.4	66	4.0	126	7.7
7	9 01.8	9 03.2	8 37.1	7	0.4	67	4.1	127	7.7
8	9 02.0	9 03.5	8 37.3	8	0.5	68	4.1	128	7.8
9	9 02.3	9 03.7	8 37.5	9	0.5	69	4.2	129	7.8
10	9 02.5	9 04.0	8 37.8	10	0.6	70	4.3	130	7.9
11	9 02.8	9 04.2	8 38.0	11	0.7	71	4.3	131	8.0
12	9 03.0	9 04.5	8 38.3	12	0.7	72	4.4	132	8.0
13	9 03.3	9 04.7	8 38.5	13	0.8	73	4.4	133	8.1
14	9 03.5	9 05.0	8 38.7	14	0.9	74	4.5	134	8.2
15	9 03.8	9 05.2	8 39.0	15	0.9	75	4.6	135	8.2
16	9 04.0	9 05.5	8 39.2	16	1.0	76	4.6	136	8.3
17	9 04.3	9 05.7	8 39.5	17	1.0	77	4.7	137	8.3
18	9 04.5	9 06.0	8 39.7	18	1.1	78	4.7	138	8.4
19	9 04.8	9 06.2	8 39.9	19	1.2	79	4.8	139	8.5
20	9 05.0	9 06.5	8 40.2	20	1.2	80	4.9	140	8.5
21	9 05.3	9 06.7	8 40.4	21	1.3	81	4.9	141	8.6
22	9 05.5	9 07.0	8 40.6	22	1.3	82	5.0	142	8.6
23	9 05.8	9 07.2	8 40.9	23	1.4	83	5.0	143	8.7
24	9 06.0	9 07.5	8 41.1	24	1.5	84	5.1	144	8.8
25	9 06.3	9 07.7	8 41.4	25	1.5	85	5.2	145	8.8
26	9 06.5	9 08.0	8 41.6	26	1.6	86	5.2	146	8.9
27	9 06.8	9 08.2	8 41.8	27	1.6	87	5.3	147	8.9
28	9 07.0	9 08.5	8 42.1	28	1.7	88	5.4	148	9.0
29	9 07.3	9 08.7	8 42.3	29	1.8	89	5.4	149	9.1
30	9 07.5	9 09.0	8 42.6	30	1.8	90	5.5	150	9.1
31	9 07.8	9 09.2	8 42.8	31	1.9	91	5.5	151	9.2
32	9 08.0	9 09.5	8 43.0	32	1.9	92	5.6	152	9.2
33	9 08.3	9 09.8	8 43.3	33	2.0	93	5.7	153	9.3
34	9 08.5	9 10.0	8 43.5	34	2.1	94	5.7	154	9.4
35	9 08.8	9 10.3	8 43.8	35	2.1	95	5.8	155	9.4
36	9 09.0	9 10.5	8 44.0	36	2.2	96	5.8	156	9.5
37	9 09.3	9 10.8	8 44.2	37	2.3	97	5.9	157	9.6
38	9 09.5	9 11.0	8 44.5	38	2.3	98	6.0	158	9.6
39	9 09.8	9 11.3	8 44.7	39	2.4	99	6.0	159	9.7
40	9 10.0	9 11.5	8 44.9	40	2.4	100	6.1	160	9.7
41	9 10.3	9 11.8	8 45.2	41	2.5	101	6.1	161	9.8
42	9 10.5	9 12.0	8 45.4	42	2.6	102	6.2	162	9.9
43	9 10.8	9 12.3	8 45.7	43	2.6	103	6.3	163	9.9
44	9 11.0	9 12.5	8 45.9	44	2.7	104	6.3	164	10.0
45	9 11.3	9 12.8	8 46.1	45	2.7	105	6.4	165	10.0
46	9 11.5	9 13.0	8 46.4	46	2.8	106	6.4	166	10.1
47	9 11.8	9 13.3	8 46.6	47	2.9	107	6.5	167	10.2
48	9 12.0	9 13.5	8 46.9	48	2.9	108	6.6	168	10.2
49	9 12.3	9 13.8	8 47.1	49	3.0	109	6.6	169	10.3
50	9 12.5	9 14.0	8 47.3	50	3.0	110	6.7	170	10.3
51	9 12.8	9 14.3	8 47.6	51	3.1	111	6.8	171	10.4
52	9 13.0	9 14.5	8 47.8	52	3.2	112	6.8	172	10.5
53	9 13.3	9 14.8	8 48.0	53	3.2	113	6.9	173	10.5
54	9 13.5	9 15.0	8 48.3	54	3.3	114	6.9	174	10.6
55	9 13.8	9 15.3	8 48.5	55	3.3	115	7.0	175	10.6
56	9 14.0	9 15.5	8 48.8	56	3.4	116	7.1	176	10.7
57	9 14.3	9 15.8	8 49.0	57	3.5	117	7.1	177	10.8
58	9 14.5	9 16.0	8 49.2	58	3.5	118	7.2	178	10.8
59	9 14.8	9 16.3	8 49.5	59	3.6	119	7.2	179	10.9
60	9 15.0	9 16.5	8 49.7	60	3.7	120	7.3	180	11.0

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Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	9 15.0	9 16.5	8 49.7	0	0.0	60	3.8	120	7.5
1	9 15.3	9 16.8	8 50.0	1	0.1	61	3.8	121	7.6
2	9 15.5	9 17.0	8 50.2	2	0.1	62	3.9	122	7.6
3	9 15.8	9 17.3	8 50.4	3	0.2	63	3.9	123	7.7
4	9 16.0	9 17.5	8 50.7	4	0.3	64	4.0	124	7.8
5	9 16.3	9 17.8	8 50.9	5	0.3	65	4.1	125	7.8
6	9 16.5	9 18.0	8 51.1	6	0.4	66	4.1	126	7.9
7	9 16.8	9 18.3	8 51.4	7	0.4	67	4.2	127	7.9
8	9 17.0	9 18.5	8 51.6	8	0.5	68	4.3	128	8.0
9	9 17.3	9 18.8	8 51.9	9	0.6	69	4.3	129	8.1
10	9 17.5	9 19.0	8 52.1	10	0.6	70	4.4	130	8.1
11	9 17.8	9 19.3	8 52.3	11	0.7	71	4.4	131	8.2
12	9 18.0	9 19.5	8 52.6	12	0.8	72	4.5	132	8.3
13	9 18.3	9 19.8	8 52.8	13	0.8	73	4.6	133	8.3
14	9 18.5	9 20.0	8 53.1	14	0.9	74	4.6	134	8.4
15	9 18.8	9 20.3	8 53.3	15	0.9	75	4.7	135	8.4
16	9 19.0	9 20.5	8 53.5	16	1.0	76	4.8	136	8.5
17	9 19.3	9 20.8	8 53.8	17	1.1	77	4.8	137	8.6
18	9 19.5	9 21.0	8 54.0	18	1.1	78	4.9	138	8.6
19	9 19.8	9 21.3	8 54.3	19	1.2	79	4.9	139	8.7
20	9 20.0	9 21.5	8 54.5	20	1.3	80	5.0	140	8.8
21	9 20.3	9 21.8	8 54.7	21	1.3	81	5.1	141	8.8
22	9 20.5	9 22.0	8 55.0	22	1.4	82	5.1	142	8.9
23	9 20.8	9 22.3	8 55.2	23	1.4	83	5.2	143	8.9
24	9 21.0	9 22.5	8 55.4	24	1.5	84	5.3	144	9.0
25	9 21.3	9 22.8	8 55.7	25	1.6	85	5.3	145	9.1
26	9 21.5	9 23.0	8 55.9	26	1.6	86	5.4	146	9.1
27	9 21.8	9 23.3	8 56.2	27	1.7	87	5.4	147	9.2
28	9 22.0	9 23.5	8 56.4	28	1.8	88	5.5	148	9.3
29	9 22.3	9 23.8	8 56.6	29	1.8	89	5.6	149	9.3
30	9 22.5	9 24.0	8 56.9	30	1.9	90	5.6	150	9.4
31	9 22.8	9 24.3	8 57.1	31	1.9	91	5.7	151	9.4
32	9 23.0	9 24.5	8 57.4	32	2.0	92	5.8	152	9.5
33	9 23.3	9 24.8	8 57.6	33	2.1	93	5.8	153	9.6
34	9 23.5	9 25.0	8 57.8	34	2.1	94	5.9	154	9.6
35	9 23.8	9 25.3	8 58.1	35	2.2	95	5.9	155	9.7
36	9 24.0	9 25.5	8 58.3	36	2.3	96	6.0	156	9.8
37	9 24.3	9 25.8	8 58.5	37	2.3	97	6.1	157	9.8
38	9 24.5	9 26.0	8 58.8	38	2.4	98	6.1	158	9.9
39	9 24.8	9 26.3	8 59.0	39	2.4	99	6.2	159	9.9
40	9 25.0	9 26.5	8 59.3	40	2.5	100	6.3	160	10.0
41	9 25.3	9 26.8	8 59.5	41	2.6	101	6.3	161	10.1
42	9 25.5	9 27.0	8 59.7	42	2.6	102	6.4	162	10.1
43	9 25.8	9 27.3	9 00.0	43	2.7	103	6.4	163	10.2
44	9 26.0	9 27.5	9 00.2	44	2.8	104	6.5	164	10.3
45	9 26.3	9 27.8	9 00.5	45	2.8	105	6.6	165	10.3
46	9 26.5	9 28.1	9 00.7	46	2.9	106	6.6	166	10.4
47	9 26.8	9 28.3	9 00.9	47	2.9	107	6.7	167	10.4
48	9 27.0	9 28.6	9 01.2	48	3.0	108	6.8	168	10.5
49	9 27.3	9 28.8	9 01.4	49	3.1	109	6.8	169	10.6
50	9 27.5	9 29.1	9 01.6	50	3.1	110	6.9	170	10.6
51	9 27.8	9 29.3	9 01.9	51	3.2	111	6.9	171	10.7
52	9 28.0	9 29.6	9 02.1	52	3.3	112	7.0	172	10.8
53	9 28.3	9 29.8	9 02.4	53	3.3	113	7.1	173	10.8
54	9 28.5	9 30.1	9 02.6	54	3.4	114	7.1	174	10.9
55	9 28.8	9 30.3	9 02.8	55	3.4	115	7.2	175	10.9
56	9 29.0	9 30.6	9 03.1	56	3.5	116	7.3	176	11.0
57	9 29.3	9 30.8	9 03.3	57	3.6	117	7.3	177	11.1
58	9 29.5	9 31.1	9 03.6	58	3.6	118	7.4	178	11.1
59	9 29.8	9 31.3	9 03.8	59	3.7	119	7.4	179	11.2
60	9 30.0	9 31.6	9 04.0	60	3.8	120	7.5	180	11.3

38ᵐ

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	9 30.0	9 31.6	9 04.0	0	0.0	60	3.9	120	7.7
1	9 30.3	9 31.8	9 04.3	1	0.1	61	3.9	121	7.8
2	9 30.5	9 32.1	9 04.5	2	0.1	62	4.0	122	7.8
3	9 30.8	9 32.3	9 04.7	3	0.2	63	4.0	123	7.9
4	9 31.0	9 32.6	9 05.0	4	0.3	64	4.1	124	8.0
5	9 31.3	9 32.8	9 05.2	5	0.3	65	4.2	125	8.0
6	9 31.5	9 33.1	9 05.5	6	0.4	66	4.2	126	8.1
7	9 31.8	9 33.3	9 05.7	7	0.4	67	4.3	127	8.1
8	9 32.0	9 33.6	9 05.9	8	0.5	68	4.4	128	8.2
9	9 32.3	9 33.8	9 06.2	9	0.6	69	4.4	129	8.3
10	9 32.5	9 34.1	9 06.4	10	0.6	70	4.5	130	8.3
11	9 32.8	9 34.3	9 06.7	11	0.7	71	4.6	131	8.4
12	9 33.0	9 34.6	9 06.9	12	0.8	72	4.6	132	8.5
13	9 33.3	9 34.8	9 07.1	13	0.8	73	4.7	133	8.5
14	9 33.5	9 35.1	9 07.4	14	0.9	74	4.7	134	8.6
15	9 33.8	9 35.3	9 07.6	15	1.0	75	4.8	135	8.7
16	9 34.0	9 35.6	9 07.9	16	1.0	76	4.9	136	8.7
17	9 34.3	9 35.8	9 08.1	17	1.1	77	4.9	137	8.8
18	9 34.5	9 36.1	9 08.3	18	1.2	78	5.0	138	8.9
19	9 34.8	9 36.3	9 08.6	19	1.2	79	5.1	139	8.9
20	9 35.0	9 36.6	9 08.8	20	1.3	80	5.1	140	9.0
21	9 35.3	9 36.8	9 09.0	21	1.3	81	5.2	141	9.0
22	9 35.5	9 37.1	9 09.3	22	1.4	82	5.3	142	9.1
23	9 35.8	9 37.3	9 09.5	23	1.5	83	5.3	143	9.2
24	9 36.0	9 37.6	9 09.8	24	1.5	84	5.4	144	9.2
25	9 36.3	9 37.8	9 10.0	25	1.6	85	5.5	145	9.3
26	9 36.5	9 38.1	9 10.2	26	1.7	86	5.5	146	9.4
27	9 36.8	9 38.3	9 10.5	27	1.7	87	5.6	147	9.4
28	9 37.0	9 38.6	9 10.7	28	1.8	88	5.6	148	9.5
29	9 37.3	9 38.8	9 11.0	29	1.9	89	5.7	149	9.6
30	9 37.5	9 39.1	9 11.2	30	1.9	90	5.8	150	9.6
31	9 37.8	9 39.3	9 11.4	31	2.0	91	5.8	151	9.7
32	9 38.0	9 39.6	9 11.7	32	2.1	92	5.9	152	9.8
33	9 38.3	9 39.8	9 11.9	33	2.1	93	6.0	153	9.8
34	9 38.5	9 40.1	9 12.1	34	2.2	94	6.0	154	9.9
35	9 38.8	9 40.3	9 12.4	35	2.2	95	6.1	155	9.9
36	9 39.0	9 40.6	9 12.6	36	2.3	96	6.2	156	10.0
37	9 39.3	9 40.8	9 12.9	37	2.4	97	6.2	157	10.1
38	9 39.5	9 41.1	9 13.1	38	2.4	98	6.3	158	10.1
39	9 39.8	9 41.3	9 13.3	39	2.5	99	6.4	159	10.2
40	9 40.0	9 41.6	9 13.6	40	2.6	100	6.4	160	10.3
41	9 40.3	9 41.8	9 13.8	41	2.6	101	6.5	161	10.3
42	9 40.5	9 42.1	9 14.1	42	2.7	102	6.5	162	10.4
43	9 40.8	9 42.3	9 14.3	43	2.8	103	6.6	163	10.5
44	9 41.0	9 42.6	9 14.5	44	2.8	104	6.7	164	10.5
45	9 41.3	9 42.8	9 14.8	45	2.9	105	6.7	165	10.6
46	9 41.5	9 43.1	9 15.0	46	3.0	106	6.8	166	10.7
47	9 41.8	9 43.3	9 15.2	47	3.0	107	6.9	167	10.7
48	9 42.0	9 43.6	9 15.5	48	3.1	108	6.9	168	10.8
49	9 42.3	9 43.8	9 15.7	49	3.1	109	7.0	169	10.8
50	9 42.5	9 44.1	9 16.0	50	3.2	110	7.1	170	10.9
51	9 42.8	9 44.3	9 16.2	51	3.3	111	7.1	171	11.0
52	9 43.0	9 44.6	9 16.4	52	3.3	112	7.2	172	11.0
53	9 43.3	9 44.8	9 16.7	53	3.4	113	7.3	173	11.1
54	9 43.5	9 45.1	9 16.9	54	3.5	114	7.3	174	11.2
55	9 43.8	9 45.3	9 17.2	55	3.5	115	7.4	175	11.2
56	9 44.0	9 45.6	9 17.4	56	3.6	116	7.4	176	11.3
57	9 44.3	9 45.8	9 17.6	57	3.7	117	7.5	177	11.4
58	9 44.5	9 46.1	9 17.9	58	3.7	118	7.6	178	11.4
59	9 44.8	9 46.4	9 18.1	59	3.8	119	7.6	179	11.5
60	9 45.0	9 46.6	9 18.4	60	3.9	120	7.7	180	11.6

39ᵐ

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	9 45.0	9 46.6	9 18.4	0	0.0	60	4.0	120	7.9
1	9 45.3	9 46.9	9 18.6	1	0.1	61	4.0	121	8.0
2	9 45.5	9 47.1	9 18.8	2	0.1	62	4.1	122	8.0
3	9 45.8	9 47.4	9 19.1	3	0.2	63	4.1	123	8.1
4	9 46.0	9 47.6	9 19.3	4	0.3	64	4.2	124	8.2
5	9 46.3	9 47.9	9 19.5	5	0.3	65	4.3	125	8.2
6	9 46.5	9 48.1	9 19.8	6	0.4	66	4.3	126	8.3
7	9 46.8	9 48.4	9 20.0	7	0.5	67	4.4	127	8.4
8	9 47.0	9 48.6	9 20.3	8	0.5	68	4.5	128	8.4
9	9 47.3	9 48.9	9 20.5	9	0.6	69	4.5	129	8.5
10	9 47.5	9 49.1	9 20.7	10	0.7	70	4.6	130	8.6
11	9 47.8	9 49.4	9 21.0	11	0.7	71	4.7	131	8.6
12	9 48.0	9 49.6	9 21.2	12	0.8	72	4.7	132	8.7
13	9 48.3	9 49.9	9 21.5	13	0.9	73	4.8	133	8.8
14	9 48.5	9 50.1	9 21.7	14	0.9	74	4.9	134	8.8
15	9 48.8	9 50.4	9 21.9	15	1.0	75	4.9	135	8.9
16	9 49.0	9 50.6	9 22.2	16	1.1	76	5.0	136	9.0
17	9 49.3	9 50.9	9 22.4	17	1.1	77	5.1	137	9.0
18	9 49.5	9 51.1	9 22.6	18	1.2	78	5.1	138	9.1
19	9 49.8	9 51.4	9 22.9	19	1.3	79	5.2	139	9.2
20	9 50.0	9 51.6	9 23.1	20	1.3	80	5.3	140	9.2
21	9 50.3	9 51.9	9 23.4	21	1.4	81	5.3	141	9.3
22	9 50.5	9 52.1	9 23.6	22	1.4	82	5.4	142	9.3
23	9 50.8	9 52.4	9 23.8	23	1.5	83	5.5	143	9.4
24	9 51.0	9 52.6	9 24.1	24	1.6	84	5.5	144	9.5
25	9 51.3	9 52.9	9 24.3	25	1.6	85	5.6	145	9.5
26	9 51.5	9 53.1	9 24.6	26	1.7	86	5.7	146	9.6
27	9 51.8	9 53.4	9 24.8	27	1.8	87	5.7	147	9.7
28	9 52.0	9 53.6	9 25.0	28	1.8	88	5.8	148	9.7
29	9 52.3	9 53.9	9 25.3	29	1.9	89	5.9	149	9.8
30	9 52.5	9 54.1	9 25.5	30	2.0	90	5.9	150	9.9
31	9 52.8	9 54.4	9 25.7	31	2.0	91	6.0	151	9.9
32	9 53.0	9 54.6	9 26.0	32	2.1	92	6.1	152	10.0
33	9 53.3	9 54.9	9 26.2	33	2.2	93	6.1	153	10.1
34	9 53.5	9 55.1	9 26.5	34	2.2	94	6.2	154	10.1
35	9 53.8	9 55.4	9 26.7	35	2.3	95	6.3	155	10.2
36	9 54.0	9 55.6	9 26.9	36	2.4	96	6.3	156	10.3
37	9 54.3	9 55.9	9 27.2	37	2.4	97	6.4	157	10.3
38	9 54.5	9 56.1	9 27.4	38	2.5	98	6.5	158	10.4
39	9 54.8	9 56.4	9 27.7	39	2.6	99	6.5	159	10.5
40	9 55.0	9 56.6	9 27.9	40	2.6	100	6.6	160	10.5
41	9 55.3	9 56.9	9 28.1	41	2.7	101	6.6	161	10.6
42	9 55.5	9 57.1	9 28.4	42	2.8	102	6.7	162	10.7
43	9 55.8	9 57.4	9 28.6	43	2.8	103	6.8	163	10.7
44	9 56.0	9 57.6	9 28.8	44	2.9	104	6.8	164	10.8
45	9 56.3	9 57.9	9 29.1	45	3.0	105	6.9	165	10.9
46	9 56.5	9 58.1	9 29.3	46	3.0	106	7.0	166	10.9
47	9 56.8	9 58.4	9 29.6	47	3.1	107	7.0	167	11.0
48	9 57.0	9 58.6	9 29.8	48	3.2	108	7.1	168	11.1
49	9 57.3	9 58.9	9 30.0	49	3.2	109	7.2	169	11.1
50	9 57.5	9 59.1	9 30.3	50	3.3	110	7.2	170	11.2
51	9 57.8	9 59.4	9 30.5	51	3.4	111	7.3	171	11.3
52	9 58.0	9 59.6	9 30.8	52	3.4	112	7.4	172	11.3
53	9 58.3	9 59.9	9 31.0	53	3.5	113	7.4	173	11.4
54	9 58.5	10 00.1	9 31.2	54	3.6	114	7.5	174	11.5
55	9 58.8	10 00.4	9 31.5	55	3.6	115	7.6	175	11.5
56	9 59.0	10 00.6	9 31.7	56	3.7	116	7.6	176	11.6
57	9 59.3	10 00.9	9 32.0	57	3.8	117	7.7	177	11.7
58	9 59.5	10 01.1	9 32.2	58	3.8	118	7.8	178	11.7
59	9 59.8	10 01.4	9 32.4	59	3.9	119	7.8	179	11.8
60	10 00.0	10 01.6	9 32.7	60	4.0	120	7.9	180	11.9

40m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	10 00.0	10 01.6	9 32.7	0	0.0	60	4.1	120	8.1
1	10 00.3	10 01.9	9 32.9	1	0.1	61	4.1	121	8.2
2	10 00.5	10 02.1	9 33.1	2	0.1	62	4.2	122	8.2
3	10 00.8	10 02.4	9 33.4	3	0.2	63	4.3	123	8.3
4	10 01.0	10 02.6	9 33.6	4	0.3	64	4.3	124	8.4
5	10 01.3	10 02.9	9 33.9	5	0.3	65	4.4	125	8.4
6	10 01.5	10 03.1	9 34.1	6	0.4	66	4.5	126	8.5
7	10 01.8	10 03.4	9 34.3	7	0.5	67	4.5	127	8.6
8	10 02.0	10 03.6	9 34.6	8	0.5	68	4.6	128	8.6
9	10 02.3	10 03.9	9 34.8	9	0.6	69	4.7	129	8.7
10	10 02.5	10 04.1	9 35.1	10	0.7	70	4.7	130	8.8
11	10 02.8	10 04.4	9 35.3	11	0.7	71	4.8	131	8.8
12	10 03.0	10 04.7	9 35.5	12	0.8	72	4.9	132	8.9
13	10 03.3	10 04.9	9 35.8	13	0.9	73	4.9	133	9.0
14	10 03.5	10 05.2	9 36.0	14	0.9	74	5.0	134	9.0
15	10 03.8	10 05.4	9 36.2	15	1.0	75	5.1	135	9.1
16	10 04.0	10 05.7	9 36.5	16	1.1	76	5.1	136	9.2
17	10 04.3	10 05.9	9 36.7	17	1.1	77	5.2	137	9.2
18	10 04.5	10 06.2	9 37.0	18	1.2	78	5.3	138	9.3
19	10 04.8	10 06.4	9 37.2	19	1.3	79	5.3	139	9.4
20	10 05.0	10 06.7	9 37.4	20	1.4	80	5.4	140	9.5
21	10 05.3	10 06.9	9 37.7	21	1.4	81	5.5	141	9.5
22	10 05.5	10 07.2	9 37.9	22	1.5	82	5.5	142	9.6
23	10 05.8	10 07.4	9 38.2	23	1.6	83	5.6	143	9.7
24	10 06.0	10 07.7	9 38.4	24	1.6	84	5.7	144	9.7
25	10 06.3	10 07.9	9 38.6	25	1.7	85	5.7	145	9.8
26	10 06.5	10 08.2	9 38.9	26	1.8	86	5.8	146	9.9
27	10 06.8	10 08.4	9 39.1	27	1.8	87	5.9	147	9.9
28	10 07.0	10 08.7	9 39.3	28	1.9	88	5.9	148	10.0
29	10 07.3	10 08.9	9 39.6	29	2.0	89	6.0	149	10.1
30	10 07.5	10 09.2	9 39.8	30	2.0	90	6.1	150	10.1
31	10 07.8	10 09.4	9 40.1	31	2.1	91	6.1	151	10.2
32	10 08.0	10 09.7	9 40.3	32	2.2	92	6.2	152	10.3
33	10 08.3	10 09.9	9 40.5	33	2.2	93	6.3	153	10.3
34	10 08.5	10 10.2	9 40.8	34	2.3	94	6.3	154	10.4
35	10 08.8	10 10.4	9 41.0	35	2.4	95	6.4	155	10.5
36	10 09.0	10 10.7	9 41.3	36	2.4	96	6.5	156	10.5
37	10 09.3	10 10.9	9 41.5	37	2.5	97	6.5	157	10.6
38	10 09.5	10 11.2	9 41.7	38	2.6	98	6.6	158	10.7
39	10 09.8	10 11.4	9 42.0	39	2.6	99	6.7	159	10.7
40	10 10.0	10 11.7	9 42.2	40	2.7	100	6.8	160	10.8
41	10 10.3	10 11.9	9 42.4	41	2.8	101	6.8	161	10.9
42	10 10.5	10 12.2	9 42.7	42	2.8	102	6.9	162	10.9
43	10 10.8	10 12.4	9 42.9	43	2.9	103	7.0	163	11.0
44	10 11.0	10 12.7	9 43.2	44	3.0	104	7.0	164	11.1
45	10 11.3	10 12.9	9 43.4	45	3.0	105	7.1	165	11.1
46	10 11.5	10 13.2	9 43.6	46	3.1	106	7.2	166	11.2
47	10 11.8	10 13.4	9 43.9	47	3.2	107	7.2	167	11.3
48	10 12.0	10 13.7	9 44.1	48	3.2	108	7.3	168	11.3
49	10 12.3	10 13.9	9 44.4	49	3.3	109	7.4	169	11.4
50	10 12.5	10 14.2	9 44.6	50	3.4	110	7.4	170	11.5
51	10 12.8	10 14.4	9 44.8	51	3.4	111	7.5	171	11.5
52	10 13.0	10 14.7	9 45.1	52	3.5	112	7.6	172	11.6
53	10 13.3	10 14.9	9 45.3	53	3.6	113	7.6	173	11.7
54	10 13.5	10 15.2	9 45.6	54	3.6	114	7.7	174	11.7
55	10 13.8	10 15.4	9 45.8	55	3.7	115	7.8	175	11.8
56	10 14.0	10 15.7	9 46.0	56	3.8	116	7.8	176	11.9
57	10 14.3	10 15.9	9 46.3	57	3.8	117	7.9	177	11.9
58	10 14.5	10 16.2	9 46.5	58	3.9	118	8.0	178	12.0
59	10 14.8	10 16.4	9 46.7	59	4.0	119	8.0	179	12.1
60	10 15.0	10 16.7	9 47.0	60	4.1	120	8.1	180	12.2

41m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	10 15.0	10 16.7	9 47.0	0	0.0	60	4.2	120	8.3
1	10 15.3	10 16.9	9 47.2	1	0.1	61	4.2	121	8.4
2	10 15.5	10 17.2	9 47.5	2	0.1	62	4.3	122	8.4
3	10 15.8	10 17.4	9 47.7	3	0.2	63	4.4	123	8.5
4	10 16.0	10 17.7	9 47.9	4	0.3	64	4.4	124	8.6
5	10 16.3	10 17.9	9 48.2	5	0.3	65	4.5	125	8.6
6	10 16.5	10 18.2	9 48.4	6	0.4	66	4.6	126	8.7
7	10 16.8	10 18.4	9 48.7	7	0.5	67	4.6	127	8.8
8	10 17.0	10 18.7	9 48.9	8	0.6	68	4.7	128	8.9
9	10 17.3	10 18.9	9 49.1	9	0.6	69	4.8	129	8.9
10	10 17.5	10 19.2	9 49.4	10	0.7	70	4.8	130	9.0
11	10 17.8	10 19.4	9 49.6	11	0.8	71	4.9	131	9.1
12	10 18.0	10 19.7	9 49.8	12	0.8	72	5.0	132	9.1
13	10 18.3	10 19.9	9 50.1	13	0.9	73	5.0	133	9.2
14	10 18.5	10 20.2	9 50.3	14	1.0	74	5.1	134	9.3
15	10 18.8	10 20.4	9 50.6	15	1.0	75	5.2	135	9.3
16	10 19.0	10 20.7	9 50.8	16	1.1	76	5.3	136	9.4
17	10 19.3	10 20.9	9 51.0	17	1.2	77	5.3	137	9.5
18	10 19.5	10 21.2	9 51.3	18	1.2	78	5.4	138	9.5
19	10 19.8	10 21.4	9 51.5	19	1.3	79	5.5	139	9.6
20	10 20.0	10 21.7	9 51.8	20	1.4	80	5.5	140	9.7
21	10 20.3	10 21.9	9 52.0	21	1.5	81	5.6	141	9.8
22	10 20.5	10 22.2	9 52.2	22	1.5	82	5.7	142	9.8
23	10 20.8	10 22.4	9 52.5	23	1.6	83	5.7	143	9.9
24	10 21.0	10 22.7	9 52.7	24	1.7	84	5.8	144	10.0
25	10 21.3	10 23.0	9 52.9	25	1.7	85	5.9	145	10.0
26	10 21.5	10 23.2	9 53.2	26	1.8	86	5.9	146	10.1
27	10 21.8	10 23.5	9 53.4	27	1.9	87	6.0	147	10.2
28	10 22.0	10 23.7	9 53.7	28	1.9	88	6.1	148	10.2
29	10 22.3	10 24.0	9 53.9	29	2.0	89	6.2	149	10.3
30	10 22.5	10 24.2	9 54.1	30	2.1	90	6.2	150	10.4
31	10 22.8	10 24.5	9 54.4	31	2.1	91	6.3	151	10.4
32	10 23.0	10 24.7	9 54.6	32	2.2	92	6.4	152	10.5
33	10 23.3	10 25.0	9 54.9	33	2.3	93	6.4	153	10.6
34	10 23.5	10 25.2	9 55.1	34	2.4	94	6.5	154	10.7
35	10 23.8	10 25.5	9 55.3	35	2.4	95	6.6	155	10.7
36	10 24.0	10 25.7	9 55.6	36	2.5	96	6.6	156	10.8
37	10 24.3	10 26.0	9 55.8	37	2.6	97	6.7	157	10.9
38	10 24.5	10 26.2	9 56.1	38	2.6	98	6.8	158	10.9
39	10 24.8	10 26.5	9 56.3	39	2.7	99	6.8	159	11.0
40	10 25.0	10 26.7	9 56.5	40	2.8	100	6.9	160	11.1
41	10 25.3	10 27.0	9 56.8	41	2.8	101	7.0	161	11.1
42	10 25.5	10 27.2	9 57.0	42	2.9	102	7.1	162	11.2
43	10 25.8	10 27.5	9 57.2	43	3.0	103	7.1	163	11.3
44	10 26.0	10 27.7	9 57.5	44	3.0	104	7.2	164	11.3
45	10 26.3	10 28.0	9 57.7	45	3.1	105	7.3	165	11.4
46	10 26.5	10 28.2	9 58.0	46	3.2	106	7.3	166	11.5
47	10 26.8	10 28.5	9 58.2	47	3.3	107	7.4	167	11.6
48	10 27.0	10 28.7	9 58.4	48	3.3	108	7.5	168	11.6
49	10 27.3	10 29.0	9 58.7	49	3.4	109	7.5	169	11.7
50	10 27.5	10 29.2	9 58.9	50	3.5	110	7.6	170	11.8
51	10 27.8	10 29.5	9 59.2	51	3.5	111	7.7	171	11.8
52	10 28.0	10 29.7	9 59.4	52	3.6	112	7.7	172	11.9
53	10 28.3	10 30.0	9 59.6	53	3.7	113	7.8	173	12.0
54	10 28.5	10 30.2	9 59.9	54	3.7	114	7.9	174	12.0
55	10 28.8	10 30.5	10 00.1	55	3.8	115	8.0	175	12.1
56	10 29.0	10 30.7	10 00.3	56	3.9	116	8.0	176	12.2
57	10 29.3	10 31.0	10 00.6	57	3.9	117	8.1	177	12.2
58	10 29.5	10 31.2	10 00.8	58	4.0	118	8.2	178	12.3
59	10 29.8	10 31.5	10 01.1	59	4.1	119	8.2	179	12.4
60	10 30.0	10 31.7	10 01.3	60	4.2	120	8.3	180	12.5

42m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	10 30.0	10 31.7	10 01.3	0	0.0	60	4.3	120	8.5
1	10 30.3	10 32.0	10 01.5	1	0.1	61	4.3	121	8.6
2	10 30.5	10 32.2	10 01.8	2	0.1	62	4.4	122	8.6
3	10 30.8	10 32.5	10 02.0	3	0.2	63	4.5	123	8.7
4	10 31.0	10 32.7	10 02.3	4	0.3	64	4.5	124	8.8
5	10 31.3	10 33.0	10 02.5	5	0.4	65	4.6	125	8.9
6	10 31.5	10 33.2	10 02.7	6	0.4	66	4.7	126	8.9
7	10 31.8	10 33.5	10 03.0	7	0.5	67	4.7	127	9.0
8	10 32.0	10 33.7	10 03.2	8	0.6	68	4.8	128	9.1
9	10 32.3	10 34.0	10 03.4	9	0.6	69	4.9	129	9.1
10	10 32.5	10 34.2	10 03.7	10	0.7	70	5.0	130	9.2
11	10 32.8	10 34.5	10 03.9	11	0.8	71	5.0	131	9.3
12	10 33.0	10 34.7	10 04.2	12	0.9	72	5.1	132	9.4
13	10 33.3	10 35.0	10 04.4	13	0.9	73	5.2	133	9.4
14	10 33.5	10 35.2	10 04.6	14	1.0	74	5.2	134	9.5
15	10 33.8	10 35.5	10 04.9	15	1.1	75	5.3	135	9.6
16	10 34.0	10 35.7	10 05.1	16	1.1	76	5.4	136	9.6
17	10 34.3	10 36.0	10 05.4	17	1.2	77	5.5	137	9.7
18	10 34.5	10 36.2	10 05.6	18	1.3	78	5.5	138	9.8
19	10 34.8	10 36.5	10 05.8	19	1.3	79	5.6	139	9.8
20	10 35.0	10 36.7	10 06.1	20	1.4	80	5.7	140	9.9
21	10 35.3	10 37.0	10 06.3	21	1.5	81	5.7	141	10.0
22	10 35.5	10 37.2	10 06.5	22	1.6	82	5.8	142	10.1
23	10 35.8	10 37.5	10 06.8	23	1.6	83	5.9	143	10.1
24	10 36.0	10 37.7	10 07.0	24	1.7	84	6.0	144	10.2
25	10 36.3	10 38.0	10 07.3	25	1.8	85	6.0	145	10.3
26	10 36.5	10 38.2	10 07.5	26	1.8	86	6.1	146	10.3
27	10 36.8	10 38.5	10 07.7	27	1.9	87	6.2	147	10.4
28	10 37.0	10 38.7	10 08.0	28	2.0	88	6.2	148	10.5
29	10 37.3	10 39.0	10 08.2	29	2.1	89	6.3	149	10.6
30	10 37.5	10 39.2	10 08.5	30	2.1	90	6.4	150	10.6
31	10 37.8	10 39.5	10 08.7	31	2.2	91	6.4	151	10.7
32	10 38.0	10 39.7	10 08.9	32	2.3	92	6.5	152	10.8
33	10 38.3	10 40.0	10 09.2	33	2.3	93	6.6	153	10.8
34	10 38.5	10 40.2	10 09.4	34	2.4	94	6.7	154	10.9
35	10 38.8	10 40.5	10 09.7	35	2.5	95	6.7	155	11.0
36	10 39.0	10 40.7	10 09.9	36	2.6	96	6.8	156	11.1
37	10 39.3	10 41.0	10 10.1	37	2.6	97	6.9	157	11.1
38	10 39.5	10 41.3	10 10.4	38	2.7	98	6.9	158	11.2
39	10 39.8	10 41.5	10 10.6	39	2.8	99	7.0	159	11.3
40	10 40.0	10 41.8	10 10.8	40	2.8	100	7.1	160	11.3
41	10 40.3	10 42.0	10 11.1	41	2.9	101	7.2	161	11.4
42	10 40.5	10 42.3	10 11.3	42	3.0	102	7.2	162	11.5
43	10 40.8	10 42.5	10 11.6	43	3.0	103	7.3	163	11.5
44	10 41.0	10 42.8	10 11.8	44	3.1	104	7.4	164	11.6
45	10 41.3	10 43.0	10 12.0	45	3.2	105	7.4	165	11.7
46	10 41.5	10 43.3	10 12.3	46	3.3	106	7.5	166	11.8
47	10 41.8	10 43.5	10 12.5	47	3.3	107	7.6	167	11.8
48	10 42.0	10 43.8	10 12.8	48	3.4	108	7.7	168	11.9
49	10 42.3	10 44.0	10 13.0	49	3.5	109	7.7	169	12.0
50	10 42.5	10 44.3	10 13.2	50	3.5	110	7.8	170	12.0
51	10 42.8	10 44.5	10 13.5	51	3.6	111	7.9	171	12.1
52	10 43.0	10 44.8	10 13.7	52	3.7	112	7.9	172	12.2
53	10 43.3	10 45.0	10 13.9	53	3.8	113	8.0	173	12.3
54	10 43.5	10 45.3	10 14.2	54	3.8	114	8.1	174	12.3
55	10 43.8	10 45.5	10 14.4	55	3.9	115	8.1	175	12.4
56	10 44.0	10 45.8	10 14.7	56	4.0	116	8.2	176	12.5
57	10 44.3	10 46.0	10 14.9	57	4.0	117	8.3	177	12.5
58	10 44.5	10 46.3	10 15.1	58	4.1	118	8.4	178	12.6
59	10 44.8	10 46.5	10 15.4	59	4.2	119	8.4	179	12.7
60	10 45.0	10 46.8	10 15.6	60	4.3	120	8.5	180	12.8

43m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	10 45.0	10 46.8	10 15.6	0	0.0	60	4.4	120	8.7
1	10 45.3	10 47.0	10 15.9	1	0.1	61	4.4	121	8.8
2	10 45.5	10 47.3	10 16.1	2	0.1	62	4.5	122	8.8
3	10 45.8	10 47.5	10 16.3	3	0.2	63	4.6	123	8.9
4	10 46.0	10 47.8	10 16.6	4	0.3	64	4.6	124	9.0
5	10 46.3	10 48.0	10 16.8	5	0.4	65	4.7	125	9.1
6	10 46.5	10 48.3	10 17.0	6	0.4	66	4.8	126	9.1
7	10 46.8	10 48.5	10 17.3	7	0.5	67	4.9	127	9.2
8	10 47.0	10 48.8	10 17.5	8	0.6	68	4.9	128	9.3
9	10 47.3	10 49.0	10 17.8	9	0.7	69	5.0	129	9.4
10	10 47.5	10 49.3	10 18.0	10	0.7	70	5.1	130	9.4
11	10 47.8	10 49.5	10 18.2	11	0.8	71	5.1	131	9.5
12	10 48.0	10 49.8	10 18.5	12	0.9	72	5.2	132	9.6
13	10 48.3	10 50.0	10 18.7	13	0.9	73	5.3	133	9.6
14	10 48.5	10 50.3	10 19.0	14	1.0	74	5.4	134	9.7
15	10 48.8	10 50.5	10 19.2	15	1.1	75	5.4	135	9.8
16	10 49.0	10 50.8	10 19.4	16	1.2	76	5.5	136	9.9
17	10 49.3	10 51.0	10 19.7	17	1.2	77	5.6	137	9.9
18	10 49.5	10 51.3	10 19.9	18	1.3	78	5.7	138	10.0
19	10 49.8	10 51.5	10 20.2	19	1.4	79	5.7	139	10.1
20	10 50.0	10 51.8	10 20.4	20	1.5	80	5.8	140	10.2
21	10 50.3	10 52.0	10 20.6	21	1.5	81	5.9	141	10.2
22	10 50.5	10 52.3	10 20.9	22	1.6	82	5.9	142	10.3
23	10 50.8	10 52.5	10 21.1	23	1.7	83	6.0	143	10.4
24	10 51.0	10 52.8	10 21.3	24	1.7	84	6.1	144	10.4
25	10 51.3	10 53.0	10 21.6	25	1.8	85	6.2	145	10.5
26	10 51.5	10 53.3	10 21.8	26	1.9	86	6.2	146	10.6
27	10 51.8	10 53.5	10 22.1	27	2.0	87	6.3	147	10.7
28	10 52.0	10 53.8	10 22.3	28	2.0	88	6.4	148	10.7
29	10 52.3	10 54.0	10 22.5	29	2.1	89	6.5	149	10.8
30	10 52.5	10 54.3	10 22.8	30	2.2	90	6.5	150	10.9
31	10 52.8	10 54.5	10 23.0	31	2.2	91	6.6	151	10.9
32	10 53.0	10 54.8	10 23.3	32	2.3	92	6.7	152	11.0
33	10 53.3	10 55.0	10 23.5	33	2.4	93	6.7	153	11.1
34	10 53.5	10 55.3	10 23.7	34	2.5	94	6.8	154	11.2
35	10 53.8	10 55.5	10 24.0	35	2.5	95	6.9	155	11.2
36	10 54.0	10 55.8	10 24.2	36	2.6	96	7.0	156	11.3
37	10 54.3	10 56.0	10 24.4	37	2.7	97	7.0	157	11.4
38	10 54.5	10 56.3	10 24.7	38	2.8	98	7.1	158	11.5
39	10 54.8	10 56.5	10 24.9	39	2.8	99	7.2	159	11.5
40	10 55.0	10 56.8	10 25.2	40	2.9	100	7.3	160	11.6
41	10 55.3	10 57.0	10 25.4	41	3.0	101	7.3	161	11.7
42	10 55.5	10 57.3	10 25.6	42	3.0	102	7.4	162	11.7
43	10 55.8	10 57.5	10 25.9	43	3.1	103	7.5	163	11.8
44	10 56.0	10 57.8	10 26.1	44	3.2	104	7.5	164	11.9
45	10 56.3	10 58.0	10 26.4	45	3.3	105	7.6	165	12.0
46	10 56.5	10 58.3	10 26.6	46	3.3	106	7.7	166	12.0
47	10 56.8	10 58.5	10 26.8	47	3.4	107	7.8	167	12.1
48	10 57.0	10 58.8	10 27.1	48	3.5	108	7.8	168	12.2
49	10 57.3	10 59.0	10 27.3	49	3.6	109	7.9	169	12.3
50	10 57.5	10 59.3	10 27.5	50	3.6	110	8.0	170	12.3
51	10 57.8	10 59.6	10 27.8	51	3.7	111	8.0	171	12.4
52	10 58.0	10 59.8	10 28.0	52	3.8	112	8.1	172	12.5
53	10 58.3	11 00.1	10 28.3	53	3.8	113	8.2	173	12.5
54	10 58.5	11 00.3	10 28.5	54	3.9	114	8.3	174	12.6
55	10 58.8	11 00.6	10 28.7	55	4.0	115	8.3	175	12.7
56	10 59.0	11 00.8	10 29.0	56	4.1	116	8.4	176	12.8
57	10 59.3	11 01.1	10 29.2	57	4.1	117	8.5	177	12.8
58	10 59.5	11 01.3	10 29.5	58	4.2	118	8.6	178	12.9
59	10 59.8	11 01.6	10 29.7	59	4.3	119	8.6	179	13.0
60	11 00.0	11 01.8	10 29.9	60	4.4	120	8.7	180	13.1

44m

Sec.	SUN PLANET ° ′	♈ ° ′	MOON ° ′	code	corr'n ′	code	corr'n ′	code	corr'n ′
0	11 00.0	11 01.8	10 29.9	0	0.0	60	4.5	120	8.9
1	11 00.3	11 02.1	10 30.2	1	0.1	61	4.5	121	9.0
2	11 00.5	11 02.3	10 30.4	2	0.1	62	4.6	122	9.0
3	11 00.8	11 02.6	10 30.6	3	0.2	63	4.7	123	9.1
4	11 01.0	11 02.8	10 30.9	4	0.3	64	4.7	124	9.2
5	11 01.3	11 03.1	10 31.1	5	0.4	65	4.8	125	9.3
6	11 01.5	11 03.3	10 31.4	6	0.4	66	4.9	126	9.3
7	11 01.8	11 03.6	10 31.6	7	0.5	67	5.0	127	9.4
8	11 02.0	11 03.8	10 31.8	8	0.6	68	5.0	128	9.5
9	11 02.3	11 04.1	10 32.1	9	0.7	69	5.1	129	9.6
10	11 02.5	11 04.3	10 32.3	10	0.7	70	5.2	130	9.6
11	11 02.8	11 04.6	10 32.6	11	0.8	71	5.3	131	9.7
12	11 03.0	11 04.8	10 32.8	12	0.9	72	5.3	132	9.8
13	11 03.3	11 05.1	10 33.0	13	1.0	73	5.4	133	9.9
14	11 03.5	11 05.3	10 33.3	14	1.0	74	5.5	134	9.9
15	11 03.8	11 05.6	10 33.5	15	1.1	75	5.6	135	10.0
16	11 04.0	11 05.8	10 33.8	16	1.2	76	5.6	136	10.1
17	11 04.3	11 06.1	10 34.0	17	1.3	77	5.7	137	10.2
18	11 04.5	11 06.3	10 34.2	18	1.3	78	5.8	138	10.2
19	11 04.8	11 06.6	10 34.5	19	1.4	79	5.9	139	10.3
20	11 05.0	11 06.8	10 34.7	20	1.5	80	5.9	140	10.4
21	11 05.3	11 07.1	10 34.9	21	1.6	81	6.0	141	10.5
22	11 05.5	11 07.3	10 35.2	22	1.6	82	6.1	142	10.5
23	11 05.8	11 07.6	10 35.4	23	1.7	83	6.2	143	10.6
24	11 06.0	11 07.8	10 35.7	24	1.8	84	6.2	144	10.7
25	11 06.3	11 08.1	10 35.9	25	1.9	85	6.3	145	10.8
26	11 06.5	11 08.3	10 36.1	26	1.9	86	6.4	146	10.8
27	11 06.8	11 08.6	10 36.4	27	2.0	87	6.5	147	10.9
28	11 07.0	11 08.8	10 36.6	28	2.1	88	6.5	148	11.0
29	11 07.3	11 09.1	10 36.9	29	2.2	89	6.6	149	11.1
30	11 07.5	11 09.3	10 37.1	30	2.2	90	6.7	150	11.1
31	11 07.8	11 09.6	10 37.3	31	2.3	91	6.7	151	11.2
32	11 08.0	11 09.8	10 37.6	32	2.4	92	6.8	152	11.3
33	11 08.3	11 10.1	10 37.8	33	2.4	93	6.9	153	11.3
34	11 08.5	11 10.3	10 38.0	34	2.5	94	7.0	154	11.4
35	11 08.8	11 10.6	10 38.3	35	2.6	95	7.0	155	11.5
36	11 09.0	11 10.8	10 38.5	36	2.7	96	7.1	156	11.6
37	11 09.3	11 11.1	10 38.8	37	2.7	97	7.2	157	11.6
38	11 09.5	11 11.3	10 39.0	38	2.8	98	7.3	158	11.7
39	11 09.8	11 11.6	10 39.2	39	2.9	99	7.3	159	11.8
40	11 10.0	11 11.8	10 39.5	40	3.0	100	7.4	160	11.9
41	11 10.3	11 12.1	10 39.7	41	3.0	101	7.5	161	11.9
42	11 10.5	11 12.3	10 40.0	42	3.1	102	7.6	162	12.0
43	11 10.8	11 12.6	10 40.2	43	3.2	103	7.6	163	12.1
44	11 11.0	11 12.8	10 40.4	44	3.3	104	7.7	164	12.2
45	11 11.3	11 13.1	10 40.7	45	3.3	105	7.8	165	12.2
46	11 11.5	11 13.3	10 40.9	46	3.4	106	7.9	166	12.3
47	11 11.8	11 13.6	10 41.1	47	3.5	107	7.9	167	12.4
48	11 12.0	11 13.8	10 41.4	48	3.6	108	8.0	168	12.5
49	11 12.3	11 14.1	10 41.6	49	3.6	109	8.1	169	12.5
50	11 12.5	11 14.3	10 41.9	50	3.7	110	8.2	170	12.6
51	11 12.8	11 14.6	10 42.1	51	3.8	111	8.2	171	12.7
52	11 13.0	11 14.8	10 42.3	52	3.9	112	8.3	172	12.8
53	11 13.3	11 15.1	10 42.6	53	3.9	113	8.4	173	12.8
54	11 13.5	11 15.3	10 42.8	54	4.0	114	8.5	174	12.9
55	11 13.8	11 15.6	10 43.1	55	4.1	115	8.5	175	13.0
56	11 14.0	11 15.8	10 43.3	56	4.2	116	8.6	176	13.1
57	11 14.3	11 16.1	10 43.5	57	4.2	117	8.7	177	13.1
58	11 14.5	11 16.3	10 43.8	58	4.3	118	8.8	178	13.2
59	11 14.8	11 16.6	10 44.0	59	4.4	119	8.8	179	13.3
60	11 15.0	11 16.8	10 44.3	60	4.5	120	8.9	180	13.4

45m

Sec.	SUN PLANET ° ′	♈ ° ′	MOON ° ′	code	corr'n ′	code	corr'n ′	code	corr'n ′
0	11 15.0	11 16.8	10 44.3	0	0.0	60	4.6	120	9.1
1	11 15.3	11 17.1	10 44.5	1	0.1	61	4.6	121	9.2
2	11 15.5	11 17.3	10 44.7	2	0.2	62	4.7	122	9.3
3	11 15.8	11 17.6	10 45.0	3	0.2	63	4.8	123	9.3
4	11 16.0	11 17.9	10 45.2	4	0.3	64	4.9	124	9.4
5	11 16.3	11 18.1	10 45.4	5	0.4	65	4.9	125	9.5
6	11 16.5	11 18.4	10 45.7	6	0.5	66	5.0	126	9.6
7	11 16.8	11 18.6	10 45.9	7	0.5	67	5.1	127	9.6
8	11 17.0	11 18.9	10 46.2	8	0.6	68	5.2	128	9.7
9	11 17.3	11 19.1	10 46.4	9	0.7	69	5.2	129	9.8
10	11 17.5	11 19.4	10 46.6	10	0.8	70	5.3	130	9.9
11	11 17.8	11 19.6	10 46.9	11	0.8	71	5.4	131	9.9
12	11 18.0	11 19.9	10 47.1	12	0.9	72	5.5	132	10.0
13	11 18.3	11 20.1	10 47.4	13	1.0	73	5.5	133	10.1
14	11 18.5	11 20.4	10 47.6	14	1.1	74	5.6	134	10.2
15	11 18.8	11 20.6	10 47.8	15	1.1	75	5.7	135	10.2
16	11 19.0	11 20.9	10 48.1	16	1.2	76	5.8	136	10.3
17	11 19.3	11 21.1	10 48.3	17	1.3	77	5.8	137	10.4
18	11 19.5	11 21.4	10 48.5	18	1.4	78	5.9	138	10.5
19	11 19.8	11 21.6	10 48.8	19	1.4	79	6.0	139	10.5
20	11 20.0	11 21.9	10 49.0	20	1.5	80	6.1	140	10.6
21	11 20.3	11 22.1	10 49.3	21	1.6	81	6.1	141	10.7
22	11 20.5	11 22.4	10 49.5	22	1.7	82	6.2	142	10.8
23	11 20.8	11 22.6	10 49.7	23	1.7	83	6.3	143	10.8
24	11 21.0	11 22.9	10 50.0	24	1.8	84	6.4	144	10.9
25	11 21.3	11 23.1	10 50.2	25	1.9	85	6.4	145	11.0
26	11 21.5	11 23.4	10 50.5	26	2.0	86	6.5	146	11.1
27	11 21.8	11 23.6	10 50.7	27	2.0	87	6.6	147	11.1
28	11 22.0	11 23.9	10 50.9	28	2.1	88	6.7	148	11.2
29	11 22.3	11 24.1	10 51.2	29	2.2	89	6.7	149	11.3
30	11 22.5	11 24.4	10 51.4	30	2.3	90	6.8	150	11.4
31	11 22.8	11 24.6	10 51.6	31	2.4	91	6.9	151	11.5
32	11 23.0	11 24.9	10 51.9	32	2.4	92	7.0	152	11.5
33	11 23.3	11 25.1	10 52.1	33	2.5	93	7.1	153	11.6
34	11 23.5	11 25.4	10 52.4	34	2.6	94	7.1	154	11.7
35	11 23.8	11 25.6	10 52.6	35	2.7	95	7.2	155	11.8
36	11 24.0	11 25.9	10 52.8	36	2.7	96	7.3	156	11.8
37	11 24.3	11 26.1	10 53.1	37	2.8	97	7.4	157	11.9
38	11 24.5	11 26.4	10 53.3	38	2.9	98	7.4	158	12.0
39	11 24.8	11 26.6	10 53.6	39	3.0	99	7.5	159	12.1
40	11 25.0	11 26.9	10 53.8	40	3.0	100	7.6	160	12.1
41	11 25.3	11 27.1	10 54.0	41	3.1	101	7.7	161	12.2
42	11 25.5	11 27.4	10 54.3	42	3.2	102	7.7	162	12.3
43	11 25.8	11 27.6	10 54.5	43	3.3	103	7.8	163	12.4
44	11 26.0	11 27.9	10 54.7	44	3.3	104	7.9	164	12.4
45	11 26.3	11 28.1	10 55.0	45	3.4	105	8.0	165	12.5
46	11 26.5	11 28.4	10 55.2	46	3.5	106	8.0	166	12.6
47	11 26.8	11 28.6	10 55.5	47	3.6	107	8.1	167	12.7
48	11 27.0	11 28.9	10 55.7	48	3.6	108	8.2	168	12.7
49	11 27.3	11 29.1	10 55.9	49	3.7	109	8.3	169	12.8
50	11 27.5	11 29.4	10 56.2	50	3.8	110	8.3	170	12.9
51	11 27.8	11 29.6	10 56.4	51	3.9	111	8.4	171	13.0
52	11 28.0	11 29.9	10 56.7	52	3.9	112	8.5	172	13.0
53	11 28.3	11 30.1	10 56.9	53	4.0	113	8.6	173	13.1
54	11 28.5	11 30.4	10 57.1	54	4.1	114	8.6	174	13.2
55	11 28.8	11 30.6	10 57.4	55	4.2	115	8.7	175	13.3
56	11 29.0	11 30.9	10 57.6	56	4.2	116	8.8	176	13.3
57	11 29.3	11 31.1	10 57.9	57	4.3	117	8.9	177	13.4
58	11 29.5	11 31.4	10 58.1	58	4.4	118	8.9	178	13.5
59	11 29.8	11 31.6	10 58.3	59	4.5	119	9.0	179	13.6
60	11 30.0	11 31.9	10 58.6	60	4.6	120	9.1	180	13.7

46m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	11 30.0	11 31.9	10 58.6	0	0.0	60	4.7	120	9.3
1	11 30.3	11 32.1	10 58.8	1	0.1	61	4.7	121	9.4
2	11 30.5	11 32.4	10 59.0	2	0.2	62	4.8	122	9.5
3	11 30.8	11 32.6	10 59.3	3	0.2	63	4.9	123	9.5
4	11 31.0	11 32.9	10 59.5	4	0.3	64	5.0	124	9.6
5	11 31.3	11 33.1	10 59.8	5	0.4	65	5.0	125	9.7
6	11 31.5	11 33.4	11 00.0	6	0.5	66	5.1	126	9.8
7	11 31.8	11 33.6	11 00.2	7	0.5	67	5.2	127	9.8
8	11 32.0	11 33.9	11 00.5	8	0.6	68	5.3	128	9.9
9	11 32.3	11 34.1	11 00.7	9	0.7	69	5.3	129	10.0
10	11 32.5	11 34.4	11 01.0	10	0.8	70	5.4	130	10.1
11	11 32.8	11 34.6	11 01.2	11	0.9	71	5.5	131	10.2
12	11 33.0	11 34.9	11 01.4	12	0.9	72	5.6	132	10.2
13	11 33.3	11 35.1	11 01.7	13	1.0	73	5.7	133	10.3
14	11 33.5	11 35.4	11 01.9	14	1.1	74	5.7	134	10.4
15	11 33.8	11 35.6	11 02.1	15	1.2	75	5.8	135	10.5
16	11 34.0	11 35.9	11 02.4	16	1.2	76	5.9	136	10.5
17	11 34.3	11 36.2	11 02.6	17	1.3	77	6.0	137	10.6
18	11 34.5	11 36.4	11 02.9	18	1.4	78	6.0	138	10.7
19	11 34.8	11 36.7	11 03.1	19	1.5	79	6.1	139	10.8
20	11 35.0	11 36.9	11 03.3	20	1.6	80	6.2	140	10.9
21	11 35.3	11 37.2	11 03.6	21	1.6	81	6.3	141	10.9
22	11 35.5	11 37.4	11 03.8	22	1.7	82	6.4	142	11.0
23	11 35.8	11 37.7	11 04.1	23	1.8	83	6.4	143	11.1
24	11 36.0	11 37.9	11 04.3	24	1.9	84	6.5	144	11.2
25	11 36.3	11 38.2	11 04.5	25	1.9	85	6.6	145	11.2
26	11 36.5	11 38.4	11 04.8	26	2.0	86	6.7	146	11.3
27	11 36.8	11 38.7	11 05.0	27	2.1	87	6.7	147	11.4
28	11 37.0	11 38.9	11 05.2	28	2.2	88	6.8	148	11.5
29	11 37.3	11 39.2	11 05.5	29	2.2	89	6.9	149	11.5
30	11 37.5	11 39.4	11 05.7	30	2.3	90	7.0	150	11.6
31	11 37.8	11 39.7	11 06.0	31	2.4	91	7.1	151	11.7
32	11 38.0	11 39.9	11 06.2	32	2.5	92	7.1	152	11.8
33	11 38.3	11 40.2	11 06.4	33	2.6	93	7.2	153	11.9
34	11 38.5	11 40.4	11 06.7	34	2.6	94	7.3	154	11.9
35	11 38.8	11 40.7	11 06.9	35	2.7	95	7.4	155	12.0
36	11 39.0	11 40.9	11 07.2	36	2.8	96	7.4	156	12.1
37	11 39.3	11 41.2	11 07.4	37	2.9	97	7.5	157	12.2
38	11 39.5	11 41.4	11 07.6	38	2.9	98	7.6	158	12.2
39	11 39.8	11 41.7	11 07.9	39	3.0	99	7.7	159	12.3
40	11 40.0	11 41.9	11 08.1	40	3.1	100	7.8	160	12.4
41	11 40.3	11 42.2	11 08.3	41	3.2	101	7.8	161	12.5
42	11 40.5	11 42.4	11 08.6	42	3.3	102	7.9	162	12.6
43	11 40.8	11 42.7	11 08.8	43	3.3	103	8.0	163	12.6
44	11 41.0	11 42.9	11 09.1	44	3.4	104	8.1	164	12.7
45	11 41.3	11 43.2	11 09.3	45	3.5	105	8.1	165	12.8
46	11 41.5	11 43.4	11 09.5	46	3.6	106	8.2	166	12.9
47	11 41.8	11 43.7	11 09.8	47	3.6	107	8.3	167	12.9
48	11 42.0	11 43.9	11 10.0	48	3.7	108	8.4	168	13.0
49	11 42.3	11 44.2	11 10.3	49	3.8	109	8.4	169	13.1
50	11 42.5	11 44.4	11 10.5	50	3.9	110	8.5	170	13.2
51	11 42.8	11 44.7	11 10.7	51	4.0	111	8.6	171	13.3
52	11 43.0	11 44.9	11 11.0	52	4.0	112	8.7	172	13.3
53	11 43.3	11 45.2	11 11.2	53	4.1	113	8.8	173	13.4
54	11 43.5	11 45.4	11 11.5	54	4.2	114	8.8	174	13.5
55	11 43.8	11 45.7	11 11.7	55	4.3	115	8.9	175	13.6
56	11 44.0	11 45.9	11 11.9	56	4.3	116	9.0	176	13.6
57	11 44.3	11 46.2	11 12.2	57	4.4	117	9.1	177	13.7
58	11 44.5	11 46.4	11 12.4	58	4.5	118	9.1	178	13.8
59	11 44.8	11 46.7	11 12.6	59	4.6	119	9.2	179	13.9
60	11 45.0	11 46.9	11 12.9	60	4.7	120	9.3	180	14.0

47m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	11 45.0	11 46.9	11 12.9	0	0.0	60	4.8	120	9.5
1	11 45.3	11 47.2	11 13.1	1	0.1	61	4.8	121	9.6
2	11 45.5	11 47.4	11 13.4	2	0.2	62	4.9	122	9.7
3	11 45.8	11 47.7	11 13.6	3	0.2	63	5.0	123	9.7
4	11 46.0	11 47.9	11 13.8	4	0.3	64	5.1	124	9.8
5	11 46.3	11 48.2	11 14.1	5	0.4	65	5.1	125	9.9
6	11 46.5	11 48.4	11 14.3	6	0.5	66	5.2	126	10.0
7	11 46.8	11 48.7	11 14.6	7	0.6	67	5.3	127	10.1
8	11 47.0	11 48.9	11 14.8	8	0.6	68	5.4	128	10.1
9	11 47.3	11 49.2	11 15.0	9	0.7	69	5.5	129	10.2
10	11 47.5	11 49.4	11 15.3	10	0.8	70	5.5	130	10.3
11	11 47.8	11 49.7	11 15.5	11	0.9	71	5.6	131	10.4
12	11 48.0	11 49.9	11 15.7	12	1.0	72	5.7	132	10.5
13	11 48.3	11 50.2	11 16.0	13	1.0	73	5.8	133	10.5
14	11 48.5	11 50.4	11 16.2	14	1.1	74	5.9	134	10.6
15	11 48.8	11 50.7	11 16.5	15	1.2	75	5.9	135	10.7
16	11 49.0	11 50.9	11 16.7	16	1.3	76	6.0	136	10.8
17	11 49.3	11 51.2	11 16.9	17	1.3	77	6.1	137	10.8
18	11 49.5	11 51.4	11 17.2	18	1.4	78	6.2	138	10.9
19	11 49.8	11 51.7	11 17.4	19	1.5	79	6.3	139	11.0
20	11 50.0	11 51.9	11 17.7	20	1.6	80	6.3	140	11.1
21	11 50.3	11 52.2	11 17.9	21	1.7	81	6.4	141	11.2
22	11 50.5	11 52.4	11 18.1	22	1.7	82	6.5	142	11.2
23	11 50.8	11 52.7	11 18.4	23	1.8	83	6.6	143	11.3
24	11 51.0	11 52.9	11 18.6	24	1.9	84	6.7	144	11.4
25	11 51.3	11 53.2	11 18.8	25	2.0	85	6.7	145	11.5
26	11 51.5	11 53.4	11 19.1	26	2.1	86	6.8	146	11.6
27	11 51.8	11 53.7	11 19.3	27	2.1	87	6.9	147	11.6
28	11 52.0	11 53.9	11 19.6	28	2.2	88	7.0	148	11.7
29	11 52.3	11 54.2	11 19.8	29	2.3	89	7.0	149	11.8
30	11 52.5	11 54.5	11 20.0	30	2.4	90	7.1	150	11.9
31	11 52.8	11 54.7	11 20.3	31	2.5	91	7.2	151	12.0
32	11 53.0	11 55.0	11 20.5	32	2.5	92	7.3	152	12.0
33	11 53.3	11 55.2	11 20.8	33	2.6	93	7.4	153	12.1
34	11 53.5	11 55.5	11 21.0	34	2.7	94	7.4	154	12.2
35	11 53.8	11 55.7	11 21.2	35	2.8	95	7.5	155	12.3
36	11 54.0	11 56.0	11 21.5	36	2.9	96	7.6	156	12.4
37	11 54.3	11 56.2	11 21.7	37	2.9	97	7.7	157	12.4
38	11 54.5	11 56.5	11 22.0	38	3.0	98	7.8	158	12.5
39	11 54.8	11 56.7	11 22.2	39	3.1	99	7.8	159	12.6
40	11 55.0	11 57.0	11 22.4	40	3.2	100	7.9	160	12.7
41	11 55.3	11 57.2	11 22.7	41	3.2	101	8.0	161	12.7
42	11 55.5	11 57.5	11 22.9	42	3.3	102	8.1	162	12.8
43	11 55.8	11 57.7	11 23.1	43	3.4	103	8.2	163	12.9
44	11 56.0	11 58.0	11 23.4	44	3.5	104	8.2	164	13.0
45	11 56.3	11 58.2	11 23.6	45	3.6	105	8.3	165	13.1
46	11 56.5	11 58.5	11 23.9	46	3.6	106	8.4	166	13.1
47	11 56.8	11 58.7	11 24.1	47	3.7	107	8.5	167	13.2
48	11 57.0	11 59.0	11 24.3	48	3.8	108	8.6	168	13.3
49	11 57.3	11 59.2	11 24.6	49	3.9	109	8.6	169	13.4
50	11 57.5	11 59.5	11 24.8	50	4.0	110	8.7	170	13.5
51	11 57.8	11 59.7	11 25.1	51	4.0	111	8.8	171	13.5
52	11 58.0	12 00.0	11 25.3	52	4.1	112	8.9	172	13.6
53	11 58.3	12 00.2	11 25.5	53	4.2	113	8.9	173	13.7
54	11 58.5	12 00.5	11 25.8	54	4.3	114	9.0	174	13.8
55	11 58.8	12 00.7	11 26.0	55	4.4	115	9.1	175	13.9
56	11 59.0	12 01.0	11 26.2	56	4.4	116	9.2	176	13.9
57	11 59.3	12 01.2	11 26.5	57	4.5	117	9.3	177	14.0
58	11 59.5	12 01.5	11 26.7	58	4.6	118	9.3	178	14.1
59	11 59.8	12 01.7	11 27.0	59	4.7	119	9.4	179	14.2
60	12 00.0	12 02.0	11 27.2	60	4.8	120	9.5	180	14.3

48m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	12 00.0	12 02.0	11 27.2	0	0.0	60	4.9	120	9.7
1	12 00.3	12 02.2	11 27.4	1	0.1	61	4.9	121	9.8
2	12 00.5	12 02.5	11 27.7	2	0.2	62	5.0	122	9.9
3	12 00.8	12 02.7	11 27.9	3	0.2	63	5.1	123	9.9
4	12 01.0	12 03.0	11 28.2	4	0.3	64	5.2	124	10.0
5	12 01.3	12 03.2	11 28.4	5	0.4	65	5.3	125	10.1
6	12 01.5	12 03.5	11 28.6	6	0.5	66	5.3	126	10.2
7	12 01.8	12 03.7	11 28.9	7	0.6	67	5.4	127	10.3
8	12 02.0	12 04.0	11 29.1	8	0.6	68	5.5	128	10.3
9	12 02.3	12 04.2	11 29.3	9	0.7	69	5.6	129	10.4
10	12 02.5	12 04.5	11 29.6	10	0.8	70	5.7	130	10.5
11	12 02.8	12 04.7	11 29.8	11	0.9	71	5.7	131	10.6
12	12 03.0	12 05.0	11 30.1	12	1.0	72	5.8	132	10.7
13	12 03.3	12 05.2	11 30.3	13	1.1	73	5.9	133	10.8
14	12 03.5	12 05.5	11 30.5	14	1.1	74	6.0	134	10.8
15	12 03.8	12 05.7	11 30.8	15	1.2	75	6.1	135	10.9
16	12 04.0	12 06.0	11 31.0	16	1.3	76	6.1	136	11.0
17	12 04.3	12 06.2	11 31.3	17	1.4	77	6.2	137	11.1
18	12 04.5	12 06.5	11 31.5	18	1.5	78	6.3	138	11.2
19	12 04.8	12 06.7	11 31.7	19	1.5	79	6.4	139	11.2
20	12 05.0	12 07.0	11 32.0	20	1.6	80	6.5	140	11.3
21	12 05.3	12 07.2	11 32.2	21	1.7	81	6.5	141	11.4
22	12 05.5	12 07.5	11 32.4	22	1.8	82	6.6	142	11.5
23	12 05.8	12 07.7	11 32.7	23	1.9	83	6.7	143	11.6
24	12 06.0	12 08.0	11 32.9	24	1.9	84	6.8	144	11.6
25	12 06.3	12 08.2	11 33.2	25	2.0	85	6.9	145	11.7
26	12 06.5	12 08.5	11 33.4	26	2.1	86	7.0	146	11.8
27	12 06.8	12 08.7	11 33.6	27	2.2	87	7.0	147	11.9
28	12 07.0	12 09.0	11 33.9	28	2.3	88	7.1	148	12.0
29	12 07.3	12 09.2	11 34.1	29	2.3	89	7.2	149	12.0
30	12 07.5	12 09.5	11 34.4	30	2.4	90	7.3	150	12.1
31	12 07.8	12 09.7	11 34.6	31	2.5	91	7.4	151	12.2
32	12 08.0	12 10.0	11 34.8	32	2.6	92	7.4	152	12.3
33	12 08.3	12 10.2	11 35.1	33	2.7	93	7.5	153	12.4
34	12 08.5	12 10.5	11 35.3	34	2.7	94	7.6	154	12.4
35	12 08.8	12 10.7	11 35.6	35	2.8	95	7.7	155	12.5
36	12 09.0	12 11.0	11 35.8	36	2.9	96	7.8	156	12.6
37	12 09.3	12 11.2	11 36.0	37	3.0	97	7.8	157	12.7
38	12 09.5	12 11.5	11 36.3	38	3.1	98	7.9	158	12.8
39	12 09.8	12 11.7	11 36.5	39	3.2	99	8.0	159	12.9
40	12 10.0	12 12.0	11 36.7	40	3.2	100	8.1	160	12.9
41	12 10.3	12 12.2	11 37.0	41	3.3	101	8.2	161	13.0
42	12 10.5	12 12.5	11 37.2	42	3.4	102	8.2	162	13.1
43	12 10.8	12 12.8	11 37.5	43	3.5	103	8.3	163	13.2
44	12 11.0	12 13.0	11 37.7	44	3.6	104	8.4	164	13.3
45	12 11.3	12 13.3	11 37.9	45	3.6	105	8.5	165	13.3
46	12 11.5	12 13.5	11 38.2	46	3.7	106	8.6	166	13.4
47	12 11.8	12 13.8	11 38.4	47	3.8	107	8.6	167	13.5
48	12 12.0	12 14.0	11 38.7	48	3.9	108	8.7	168	13.6
49	12 12.3	12 14.3	11 38.9	49	4.0	109	8.8	169	13.7
50	12 12.5	12 14.5	11 39.1	50	4.0	110	8.9	170	13.7
51	12 12.8	12 14.8	11 39.4	51	4.1	111	9.0	171	13.8
52	12 13.0	12 15.0	11 39.6	52	4.2	112	9.1	172	13.9
53	12 13.3	12 15.3	11 39.8	53	4.3	113	9.1	173	14.0
54	12 13.5	12 15.5	11 40.1	54	4.4	114	9.2	174	14.1
55	12 13.8	12 15.8	11 40.3	55	4.4	115	9.3	175	14.1
56	12 14.0	12 16.0	11 40.6	56	4.5	116	9.4	176	14.2
57	12 14.3	12 16.3	11 40.8	57	4.6	117	9.5	177	14.3
58	12 14.5	12 16.5	11 41.0	58	4.7	118	9.5	178	14.4
59	12 14.8	12 16.8	11 41.3	59	4.8	119	9.6	179	14.5
60	12 15.0	12 17.0	11 41.5	60	4.9	120	9.7	180	14.6

49m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	12 15.0	12 17.0	11 41.5	0	0.0	60	5.0	120	9.9
1	12 15.3	12 17.3	11 41.8	1	0.1	61	5.0	121	10.0
2	12 15.5	12 17.5	11 42.0	2	0.2	62	5.1	122	10.1
3	12 15.8	12 17.8	11 42.2	3	0.2	63	5.2	123	10.1
4	12 16.0	12 18.0	11 42.5	4	0.3	64	5.3	124	10.2
5	12 16.3	12 18.3	11 42.7	5	0.4	65	5.4	125	10.3
6	12 16.5	12 18.5	11 42.9	6	0.5	66	5.4	126	10.4
7	12 16.8	12 18.8	11 43.2	7	0.6	67	5.5	127	10.5
8	12 17.0	12 19.0	11 43.4	8	0.7	68	5.6	128	10.6
9	12 17.3	12 19.3	11 43.7	9	0.7	69	5.7	129	10.6
10	12 17.5	12 19.5	11 43.9	10	0.8	70	5.8	130	10.7
11	12 17.8	12 19.8	11 44.1	11	0.9	71	5.9	131	10.8
12	12 18.0	12 20.0	11 44.4	12	1.0	72	5.9	132	10.9
13	12 18.3	12 20.3	11 44.6	13	1.1	73	6.0	133	11.0
14	12 18.5	12 20.5	11 44.9	14	1.2	74	6.1	134	11.1
15	12 18.8	12 20.8	11 45.1	15	1.2	75	6.2	135	11.1
16	12 19.0	12 21.0	11 45.3	16	1.3	76	6.3	136	11.2
17	12 19.3	12 21.3	11 45.6	17	1.4	77	6.4	137	11.3
18	12 19.5	12 21.5	11 45.8	18	1.5	78	6.4	138	11.4
19	12 19.8	12 21.8	11 46.1	19	1.6	79	6.5	139	11.5
20	12 20.0	12 22.0	11 46.3	20	1.7	80	6.6	140	11.6
21	12 20.3	12 22.3	11 46.5	21	1.7	81	6.7	141	11.6
22	12 20.5	12 22.5	11 46.8	22	1.8	82	6.8	142	11.7
23	12 20.8	12 22.8	11 47.0	23	1.9	83	6.8	143	11.8
24	12 21.0	12 23.0	11 47.2	24	2.0	84	6.9	144	11.9
25	12 21.3	12 23.3	11 47.5	25	2.1	85	7.0	145	12.0
26	12 21.5	12 23.5	11 47.7	26	2.1	86	7.1	146	12.0
27	12 21.8	12 23.8	11 48.0	27	2.2	87	7.2	147	12.1
28	12 22.0	12 24.0	11 48.2	28	2.3	88	7.3	148	12.2
29	12 22.3	12 24.3	11 48.4	29	2.4	89	7.3	149	12.3
30	12 22.5	12 24.5	11 48.7	30	2.5	90	7.4	150	12.4
31	12 22.8	12 24.8	11 48.9	31	2.6	91	7.5	151	12.5
32	12 23.0	12 25.0	11 49.2	32	2.6	92	7.6	152	12.5
33	12 23.3	12 25.3	11 49.4	33	2.7	93	7.7	153	12.6
34	12 23.5	12 25.5	11 49.6	34	2.8	94	7.8	154	12.7
35	12 23.8	12 25.8	11 49.9	35	2.9	95	7.8	155	12.8
36	12 24.0	12 26.0	11 50.1	36	3.0	96	7.9	156	12.9
37	12 24.3	12 26.3	11 50.3	37	3.1	97	8.0	157	13.0
38	12 24.5	12 26.5	11 50.6	38	3.1	98	8.1	158	13.0
39	12 24.8	12 26.8	11 50.8	39	3.2	99	8.2	159	13.1
40	12 25.0	12 27.0	11 51.1	40	3.3	100	8.3	160	13.2
41	12 25.3	12 27.3	11 51.3	41	3.4	101	8.3	161	13.3
42	12 25.5	12 27.5	11 51.5	42	3.5	102	8.4	162	13.4
43	12 25.8	12 27.8	11 51.8	43	3.5	103	8.5	163	13.4
44	12 26.0	12 28.0	11 52.0	44	3.6	104	8.6	164	13.5
45	12 26.3	12 28.3	11 52.3	45	3.7	105	8.7	165	13.6
46	12 26.5	12 28.5	11 52.5	46	3.8	106	8.7	166	13.7
47	12 26.8	12 28.8	11 52.7	47	3.9	107	8.8	167	13.8
48	12 27.0	12 29.0	11 53.0	48	4.0	108	8.9	168	13.9
49	12 27.3	12 29.3	11 53.2	49	4.0	109	9.0	169	13.9
50	12 27.5	12 29.5	11 53.4	50	4.1	110	9.1	170	14.0
51	12 27.8	12 29.8	11 53.7	51	4.2	111	9.2	171	14.1
52	12 28.0	12 30.0	11 53.9	52	4.3	112	9.2	172	14.2
53	12 28.3	12 30.3	11 54.2	53	4.4	113	9.3	173	14.3
54	12 28.5	12 30.5	11 54.4	54	4.5	114	9.4	174	14.4
55	12 28.8	12 30.8	11 54.6	55	4.5	115	9.5	175	14.4
56	12 29.0	12 31.1	11 54.9	56	4.6	116	9.6	176	14.5
57	12 29.3	12 31.3	11 55.1	57	4.7	117	9.7	177	14.6
58	12 29.5	12 31.6	11 55.4	58	4.8	118	9.7	178	14.7
59	12 29.8	12 31.8	11 55.6	59	4.9	119	9.8	179	14.8
60	12 30.0	12 32.1	11 55.8	60	5.0	120	9.9	180	14.9

50^m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	12 30.0	12 32.1	11 55.8	0	0.0	60	5.1	120	10.1
1	12 30.3	12 32.3	11 56.1	1	0.1	61	5.1	121	10.2
2	12 30.5	12 32.6	11 56.3	2	0.2	62	5.2	122	10.3
3	12 30.8	12 32.8	11 56.5	3	0.3	63	5.3	123	10.4
4	12 31.0	12 33.1	11 56.8	4	0.3	64	5.4	124	10.4
5	12 31.3	12 33.3	11 57.0	5	0.4	65	5.5	125	10.5
6	12 31.5	12 33.6	11 57.3	6	0.5	66	5.6	126	10.6
7	12 31.8	12 33.8	11 57.5	7	0.6	67	5.6	127	10.7
8	12 32.0	12 34.1	11 57.7	8	0.7	68	5.7	128	10.8
9	12 32.3	12 34.3	11 58.0	9	0.8	69	5.8	129	10.9
10	12 32.5	12 34.6	11 58.2	10	0.8	70	5.9	130	10.9
11	12 32.8	12 34.8	11 58.5	11	0.9	71	6.0	131	11.0
12	12 33.0	12 35.1	11 58.7	12	1.0	72	6.1	132	11.1
13	12 33.3	12 35.3	11 58.9	13	1.1	73	6.1	133	11.2
14	12 33.5	12 35.6	11 59.2	14	1.2	74	6.2	134	11.3
15	12 33.8	12 35.8	11 59.4	15	1.3	75	6.3	135	11.4
16	12 34.0	12 36.1	11 59.7	16	1.3	76	6.4	136	11.4
17	12 34.3	12 36.3	11 59.9	17	1.4	77	6.5	137	11.5
18	12 34.5	12 36.6	12 00.1	18	1.5	78	6.6	138	11.6
19	12 34.8	12 36.8	12 00.4	19	1.6	79	6.6	139	11.7
20	12 35.0	12 37.1	12 00.6	20	1.7	80	6.7	140	11.8
21	12 35.3	12 37.3	12 00.8	21	1.8	81	6.8	141	11.9
22	12 35.5	12 37.6	12 01.1	22	1.9	82	6.9	142	12.0
23	12 35.8	12 37.8	12 01.3	23	1.9	83	7.0	143	12.0
24	12 36.0	12 38.1	12 01.6	24	2.0	84	7.1	144	12.1
25	12 36.3	12 38.3	12 01.8	25	2.1	85	7.2	145	12.2
26	12 36.5	12 38.6	12 02.0	26	2.2	86	7.2	146	12.3
27	12 36.8	12 38.8	12 02.3	27	2.3	87	7.3	147	12.4
28	12 37.0	12 39.1	12 02.5	28	2.4	88	7.4	148	12.5
29	12 37.3	12 39.3	12 02.8	29	2.4	89	7.5	149	12.5
30	12 37.5	12 39.6	12 03.0	30	2.5	90	7.6	150	12.6
31	12 37.8	12 39.8	12 03.2	31	2.6	91	7.7	151	12.7
32	12 38.0	12 40.1	12 03.5	32	2.7	92	7.7	152	12.8
33	12 38.3	12 40.3	12 03.7	33	2.8	93	7.8	153	12.9
34	12 38.5	12 40.6	12 03.9	34	2.9	94	7.9	154	13.0
35	12 38.8	12 40.8	12 04.2	35	2.9	95	8.0	155	13.0
36	12 39.0	12 41.1	12 04.4	36	3.0	96	8.1	156	13.1
37	12 39.3	12 41.3	12 04.7	37	3.1	97	8.2	157	13.2
38	12 39.5	12 41.6	12 04.9	38	3.2	98	8.2	158	13.3
39	12 39.8	12 41.8	12 05.1	39	3.3	99	8.3	159	13.4
40	12 40.0	12 42.1	12 05.4	40	3.4	100	8.4	160	13.5
41	12 40.3	12 42.3	12 05.6	41	3.5	101	8.5	161	13.6
42	12 40.5	12 42.6	12 05.9	42	3.5	102	8.6	162	13.6
43	12 40.8	12 42.8	12 06.1	43	3.6	103	8.7	163	13.7
44	12 41.0	12 43.1	12 06.3	44	3.7	104	8.8	164	13.8
45	12 41.3	12 43.3	12 06.6	45	3.8	105	8.8	165	13.9
46	12 41.5	12 43.6	12 06.8	46	3.9	106	8.9	166	14.0
47	12 41.8	12 43.8	12 07.0	47	4.0	107	9.0	167	14.1
48	12 42.0	12 44.1	12 07.3	48	4.0	108	9.1	168	14.1
49	12 42.3	12 44.3	12 07.5	49	4.1	109	9.2	169	14.2
50	12 42.5	12 44.6	12 07.8	50	4.2	110	9.3	170	14.3
51	12 42.8	12 44.8	12 08.0	51	4.3	111	9.3	171	14.4
52	12 43.0	12 45.1	12 08.2	52	4.4	112	9.4	172	14.5
53	12 43.3	12 45.3	12 08.5	53	4.5	113	9.5	173	14.6
54	12 43.5	12 45.6	12 08.7	54	4.5	114	9.6	174	14.6
55	12 43.8	12 45.8	12 09.0	55	4.6	115	9.7	175	14.7
56	12 44.0	12 46.1	12 09.2	56	4.7	116	9.8	176	14.8
57	12 44.3	12 46.3	12 09.4	57	4.8	117	9.8	177	14.9
58	12 44.5	12 46.6	12 09.7	58	4.9	118	9.9	178	15.0
59	12 44.8	12 46.8	12 09.9	59	5.0	119	10.0	179	15.1
60	12 45.0	12 47.1	12 10.2	60	5.1	120	10.1	180	15.2

51^m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	12 45.0	12 47.1	12 10.2	0	0.0	60	5.2	120	10.3
1	12 45.3	12 47.3	12 10.4	1	0.1	61	5.2	121	10.4
2	12 45.5	12 47.6	12 10.6	2	0.2	62	5.3	122	10.5
3	12 45.8	12 47.8	12 10.9	3	0.3	63	5.4	123	10.6
4	12 46.0	12 48.1	12 11.1	4	0.3	64	5.5	124	10.6
5	12 46.3	12 48.3	12 11.3	5	0.4	65	5.6	125	10.7
6	12 46.5	12 48.6	12 11.6	6	0.5	66	5.7	126	10.8
7	12 46.8	12 48.8	12 11.8	7	0.6	67	5.8	127	10.9
8	12 47.0	12 49.1	12 12.1	8	0.7	68	5.8	128	11.0
9	12 47.3	12 49.4	12 12.3	9	0.8	69	5.9	129	11.1
10	12 47.5	12 49.6	12 12.5	10	0.9	70	6.0	130	11.2
11	12 47.8	12 49.9	12 12.8	11	0.9	71	6.1	131	11.2
12	12 48.0	12 50.1	12 13.0	12	1.0	72	6.2	132	11.3
13	12 48.3	12 50.4	12 13.3	13	1.1	73	6.3	133	11.4
14	12 48.5	12 50.6	12 13.5	14	1.2	74	6.4	134	11.5
15	12 48.8	12 50.9	12 13.7	15	1.3	75	6.4	135	11.6
16	12 49.0	12 51.1	12 14.0	16	1.4	76	6.5	136	11.7
17	12 49.3	12 51.4	12 14.2	17	1.5	77	6.6	137	11.8
18	12 49.5	12 51.6	12 14.4	18	1.5	78	6.7	138	11.8
19	12 49.8	12 51.9	12 14.7	19	1.6	79	6.8	139	11.9
20	12 50.0	12 52.1	12 14.9	20	1.7	80	6.9	140	12.0
21	12 50.3	12 52.4	12 15.2	21	1.8	81	7.0	141	12.1
22	12 50.5	12 52.6	12 15.4	22	1.9	82	7.0	142	12.2
23	12 50.8	12 52.9	12 15.6	23	2.0	83	7.1	143	12.3
24	12 51.0	12 53.1	12 15.9	24	2.1	84	7.2	144	12.4
25	12 51.3	12 53.4	12 16.1	25	2.1	85	7.3	145	12.4
26	12 51.5	12 53.6	12 16.4	26	2.2	86	7.4	146	12.5
27	12 51.8	12 53.9	12 16.6	27	2.3	87	7.5	147	12.6
28	12 52.0	12 54.1	12 16.8	28	2.4	88	7.6	148	12.7
29	12 52.3	12 54.4	12 17.1	29	2.5	89	7.6	149	12.8
30	12 52.5	12 54.6	12 17.3	30	2.6	90	7.7	150	12.9
31	12 52.8	12 54.9	12 17.5	31	2.7	91	7.8	151	13.0
32	12 53.0	12 55.1	12 17.8	32	2.7	92	7.9	152	13.0
33	12 53.3	12 55.4	12 18.0	33	2.8	93	8.0	153	13.1
34	12 53.5	12 55.6	12 18.3	34	2.9	94	8.1	154	13.2
35	12 53.8	12 55.9	12 18.5	35	3.0	95	8.2	155	13.3
36	12 54.0	12 56.1	12 18.7	36	3.1	96	8.2	156	13.4
37	12 54.3	12 56.4	12 19.0	37	3.2	97	8.3	157	13.5
38	12 54.5	12 56.6	12 19.2	38	3.3	98	8.4	158	13.6
39	12 54.8	12 56.9	12 19.5	39	3.3	99	8.5	159	13.6
40	12 55.0	12 57.1	12 19.7	40	3.4	100	8.6	160	13.7
41	12 55.3	12 57.4	12 19.9	41	3.5	101	8.7	161	13.8
42	12 55.5	12 57.6	12 20.2	42	3.6	102	8.8	162	13.9
43	12 55.8	12 57.9	12 20.4	43	3.7	103	8.8	163	14.0
44	12 56.0	12 58.1	12 20.6	44	3.8	104	8.9	164	14.1
45	12 56.3	12 58.4	12 20.9	45	3.9	105	9.0	165	14.2
46	12 56.5	12 58.6	12 21.1	46	3.9	106	9.1	166	14.2
47	12 56.8	12 58.9	12 21.4	47	4.0	107	9.2	167	14.3
48	12 57.0	12 59.1	12 21.6	48	4.1	108	9.3	168	14.4
49	12 57.3	12 59.4	12 21.8	49	4.2	109	9.4	169	14.5
50	12 57.5	12 59.6	12 22.1	50	4.3	110	9.4	170	14.6
51	12 57.8	12 59.9	12 22.3	51	4.4	111	9.5	171	14.7
52	12 58.0	13 00.1	12 22.6	52	4.5	112	9.6	172	14.8
53	12 58.3	13 00.4	12 22.8	53	4.5	113	9.7	173	14.8
54	12 58.5	13 00.6	12 23.0	54	4.6	114	9.8	174	14.9
55	12 58.8	13 00.9	12 23.3	55	4.7	115	9.9	175	15.0
56	12 59.0	13 01.1	12 23.5	56	4.8	116	10.0	176	15.1
57	12 59.3	13 01.4	12 23.8	57	4.9	117	10.0	177	15.2
58	12 59.5	13 01.6	12 24.0	58	5.0	118	10.1	178	15.3
59	12 59.8	13 01.9	12 24.2	59	5.1	119	10.2	179	15.4
60	13 00.0	13 02.1	12 24.5	60	5.2	120	10.3	180	15.5

52m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	13 00.0	13 02.1	12 24.5	0	0.0	60	5.3	120	10.5
1	13 00.3	13 02.4	12 24.7	1	0.1	61	5.3	121	10.6
2	13 00.5	13 02.6	12 24.9	2	0.2	62	5.4	122	10.7
3	13 00.8	13 02.9	12 25.2	3	0.3	63	5.5	123	10.8
4	13 01.0	13 03.1	12 25.4	4	0.4	64	5.6	124	10.9
5	13 01.3	13 03.4	12 25.7	5	0.4	65	5.7	125	10.9
6	13 01.5	13 03.6	12 25.9	6	0.5	66	5.8	126	11.0
7	13 01.8	13 03.9	12 26.1	7	0.6	67	5.9	127	11.1
8	13 02.0	13 04.1	12 26.4	8	0.7	68	6.0	128	11.2
9	13 02.3	13 04.4	12 26.6	9	0.8	69	6.0	129	11.3
10	13 02.5	13 04.6	12 26.9	10	0.9	70	6.1	130	11.4
11	13 02.8	13 04.9	12 27.1	11	1.0	71	6.2	131	11.5
12	13 03.0	13 05.1	12 27.3	12	1.1	72	6.3	132	11.6
13	13 03.3	13 05.4	12 27.6	13	1.1	73	6.4	133	11.6
14	13 03.5	13 05.6	12 27.8	14	1.2	74	6.5	134	11.7
15	13 03.8	13 05.9	12 28.0	15	1.3	75	6.6	135	11.8
16	13 04.0	13 06.1	12 28.3	16	1.4	76	6.7	136	11.9
17	13 04.3	13 06.4	12 28.5	17	1.5	77	6.7	137	12.0
18	13 04.5	13 06.6	12 28.8	18	1.6	78	6.8	138	12.1
19	13 04.8	13 06.9	12 29.0	19	1.7	79	6.9	139	12.2
20	13 05.0	13 07.1	12 29.2	20	1.8	80	7.0	140	12.3
21	13 05.3	13 07.4	12 29.5	21	1.8	81	7.1	141	12.3
22	13 05.5	13 07.7	12 29.7	22	1.9	82	7.2	142	12.4
23	13 05.8	13 07.9	12 30.0	23	2.0	83	7.3	143	12.5
24	13 06.0	13 08.2	12 30.2	24	2.1	84	7.4	144	12.6
25	13 06.3	13 08.4	12 30.4	25	2.2	85	7.4	145	12.7
26	13 06.5	13 08.7	12 30.7	26	2.3	86	7.5	146	12.8
27	13 06.8	13 08.9	12 30.9	27	2.4	87	7.6	147	12.9
28	13 07.0	13 09.2	12 31.1	28	2.5	88	7.7	148	13.0
29	13 07.3	13 09.4	12 31.4	29	2.5	89	7.8	149	13.0
30	13 07.5	13 09.7	12 31.6	30	2.6	90	7.9	150	13.1
31	13 07.8	13 09.9	12 31.9	31	2.7	91	8.0	151	13.2
32	13 08.0	13 10.2	12 32.1	32	2.8	92	8.1	152	13.3
33	13 08.3	13 10.4	12 32.3	33	2.9	93	8.1	153	13.4
34	13 08.5	13 10.7	12 32.6	34	3.0	94	8.2	154	13.5
35	13 08.8	13 10.9	12 32.8	35	3.1	95	8.3	155	13.6
36	13 09.0	13 11.2	12 33.1	36	3.2	96	8.4	156	13.7
37	13 09.3	13 11.4	12 33.3	37	3.2	97	8.5	157	13.7
38	13 09.5	13 11.7	12 33.5	38	3.3	98	8.6	158	13.8
39	13 09.8	13 11.9	12 33.8	39	3.4	99	8.7	159	13.9
40	13 10.0	13 12.2	12 34.0	40	3.5	100	8.8	160	14.0
41	13 10.3	13 12.4	12 34.2	41	3.6	101	8.8	161	14.1
42	13 10.5	13 12.7	12 34.5	42	3.7	102	8.9	162	14.2
43	13 10.8	13 12.9	12 34.7	43	3.8	103	9.0	163	14.3
44	13 11.0	13 13.2	12 35.0	44	3.9	104	9.1	164	14.4
45	13 11.3	13 13.4	12 35.2	45	3.9	105	9.2	165	14.4
46	13 11.5	13 13.7	12 35.4	46	4.0	106	9.3	166	14.5
47	13 11.8	13 13.9	12 35.7	47	4.1	107	9.4	167	14.6
48	13 12.0	13 14.2	12 35.9	48	4.2	108	9.5	168	14.7
49	13 12.3	13 14.4	12 36.2	49	4.3	109	9.5	169	14.8
50	13 12.5	13 14.7	12 36.4	50	4.4	110	9.6	170	14.9
51	13 12.8	13 14.9	12 36.6	51	4.5	111	9.7	171	15.0
52	13 13.0	13 15.2	12 36.9	52	4.6	112	9.8	172	15.1
53	13 13.3	13 15.4	12 37.1	53	4.6	113	9.9	173	15.1
54	13 13.5	13 15.7	12 37.4	54	4.7	114	10.0	174	15.2
55	13 13.8	13 15.9	12 37.6	55	4.8	115	10.1	175	15.3
56	13 14.0	13 16.2	12 37.8	56	4.9	116	10.2	176	15.4
57	13 14.3	13 16.4	12 38.1	57	5.0	117	10.2	177	15.5
58	13 14.5	13 16.7	12 38.3	58	5.1	118	10.3	178	15.6
59	13 14.8	13 16.9	12 38.5	59	5.2	119	10.4	179	15.7
60	13 15.0	13 17.2	12 38.8	60	5.3	120	10.5	180	15.8

53m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	13 15.0	13 17.2	12 38.8	0	0.0	60	5.4	120	10.7
1	13 15.3	13 17.4	12 39.0	1	0.1	61	5.4	121	10.8
2	13 15.5	13 17.7	12 39.3	2	0.2	62	5.5	122	10.9
3	13 15.8	13 17.9	12 39.5	3	0.3	63	5.6	123	11.0
4	13 16.0	13 18.2	12 39.7	4	0.4	64	5.7	124	11.1
5	13 16.3	13 18.4	12 40.0	5	0.4	65	5.8	125	11.1
6	13 16.5	13 18.7	12 40.2	6	0.5	66	5.9	126	11.2
7	13 16.8	13 18.9	12 40.5	7	0.6	67	6.0	127	11.3
8	13 17.0	13 19.2	12 40.7	8	0.7	68	6.1	128	11.4
9	13 17.3	13 19.4	12 40.9	9	0.8	69	6.2	129	11.5
10	13 17.5	13 19.7	12 41.2	10	0.9	70	6.2	130	11.6
11	13 17.8	13 19.9	12 41.4	11	1.0	71	6.3	131	11.7
12	13 18.0	13 20.2	12 41.6	12	1.1	72	6.4	132	11.8
13	13 18.3	13 20.4	12 41.9	13	1.2	73	6.5	133	11.9
14	13 18.5	13 20.7	12 42.1	14	1.2	74	6.6	134	11.9
15	13 18.8	13 20.9	12 42.4	15	1.3	75	6.7	135	12.0
16	13 19.0	13 21.2	12 42.6	16	1.4	76	6.8	136	12.1
17	13 19.3	13 21.4	12 42.8	17	1.5	77	6.9	137	12.2
18	13 19.5	13 21.7	12 43.1	18	1.6	78	7.0	138	12.3
19	13 19.8	13 21.9	12 43.3	19	1.7	79	7.0	139	12.4
20	13 20.0	13 22.2	12 43.6	20	1.8	80	7.1	140	12.5
21	13 20.3	13 22.4	12 43.8	21	1.9	81	7.2	141	12.6
22	13 20.5	13 22.7	12 44.0	22	2.0	82	7.3	142	12.7
23	13 20.8	13 22.9	12 44.3	23	2.1	83	7.4	143	12.8
24	13 21.0	13 23.2	12 44.5	24	2.1	84	7.5	144	12.8
25	13 21.3	13 23.4	12 44.7	25	2.2	85	7.6	145	12.9
26	13 21.5	13 23.7	12 45.0	26	2.3	86	7.7	146	13.0
27	13 21.8	13 23.9	12 45.2	27	2.4	87	7.8	147	13.1
28	13 22.0	13 24.2	12 45.5	28	2.5	88	7.8	148	13.2
29	13 22.3	13 24.4	12 45.7	29	2.6	89	7.9	149	13.3
30	13 22.5	13 24.7	12 45.9	30	2.7	90	8.0	150	13.4
31	13 22.8	13 24.9	12 46.2	31	2.8	91	8.1	151	13.5
32	13 23.0	13 25.2	12 46.4	32	2.9	92	8.2	152	13.6
33	13 23.3	13 25.4	12 46.7	33	2.9	93	8.3	153	13.6
34	13 23.5	13 25.7	12 46.9	34	3.0	94	8.4	154	13.7
35	13 23.8	13 26.0	12 47.1	35	3.1	95	8.5	155	13.8
36	13 24.0	13 26.2	12 47.4	36	3.2	96	8.6	156	13.9
37	13 24.3	13 26.5	12 47.6	37	3.3	97	8.6	157	14.0
38	13 24.5	13 26.7	12 47.9	38	3.4	98	8.7	158	14.1
39	13 24.8	13 27.0	12 48.1	39	3.5	99	8.8	159	14.2
40	13 25.0	13 27.2	12 48.3	40	3.6	100	8.9	160	14.3
41	13 25.3	13 27.5	12 48.6	41	3.7	101	9.0	161	14.4
42	13 25.5	13 27.7	12 48.8	42	3.7	102	9.1	162	14.4
43	13 25.8	13 28.0	12 49.0	43	3.8	103	9.2	163	14.5
44	13 26.0	13 28.2	12 49.3	44	3.9	104	9.3	164	14.6
45	13 26.3	13 28.5	12 49.5	45	4.0	105	9.4	165	14.7
46	13 26.5	13 28.7	12 49.8	46	4.1	106	9.5	166	14.8
47	13 26.8	13 29.0	12 50.0	47	4.2	107	9.5	167	14.9
48	13 27.0	13 29.2	12 50.2	48	4.3	108	9.6	168	15.0
49	13 27.3	13 29.5	12 50.5	49	4.4	109	9.7	169	15.1
50	13 27.5	13 29.7	12 50.7	50	4.5	110	9.8	170	15.2
51	13 27.8	13 30.0	12 51.0	51	4.5	111	9.9	171	15.2
52	13 28.0	13 30.2	12 51.2	52	4.6	112	10.0	172	15.3
53	13 28.3	13 30.5	12 51.4	53	4.7	113	10.1	173	15.4
54	13 28.5	13 30.7	12 51.7	54	4.8	114	10.2	174	15.5
55	13 28.8	13 31.0	12 51.9	55	4.9	115	10.3	175	15.6
56	13 29.0	13 31.2	12 52.1	56	5.0	116	10.3	176	15.7
57	13 29.3	13 31.5	12 52.4	57	5.1	117	10.4	177	15.8
58	13 29.5	13 31.7	12 52.6	58	5.2	118	10.5	178	15.9
59	13 29.8	13 32.0	12 52.9	59	5.3	119	10.6	179	16.0
60	13 30.0	13 32.2	12 53.1	60	5.4	120	10.7	180	16.1

54m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	13 30.0	13 32.2	12 53.1	0	0.0	60	5.5	120	10.9
1	13 30.3	13 32.5	12 53.3	1	0.1	61	5.5	121	11.0
2	13 30.5	13 32.7	12 53.6	2	0.2	62	5.6	122	11.1
3	13 30.8	13 33.0	12 53.8	3	0.3	63	5.7	123	11.2
4	13 31.0	13 33.2	12 54.1	4	0.4	64	5.8	124	11.3
5	13 31.3	13 33.5	12 54.3	5	0.5	65	5.9	125	11.4
6	13 31.5	13 33.7	12 54.5	6	0.5	66	6.0	126	11.4
7	13 31.8	13 34.0	12 54.8	7	0.6	67	6.1	127	11.5
8	13 32.0	13 34.2	12 55.0	8	0.7	68	6.2	128	11.6
9	13 32.3	13 34.5	12 55.2	9	0.8	69	6.3	129	11.7
10	13 32.5	13 34.7	12 55.5	10	0.9	70	6.4	130	11.8
11	13 32.8	13 35.0	12 55.7	11	1.0	71	6.4	131	11.9
12	13 33.0	13 35.2	12 56.0	12	1.1	72	6.5	132	12.0
13	13 33.3	13 35.5	12 56.2	13	1.2	73	6.6	133	12.1
14	13 33.5	13 35.7	12 56.4	14	1.3	74	6.7	134	12.2
15	13 33.8	13 36.0	12 56.7	15	1.4	75	6.8	135	12.3
16	13 34.0	13 36.2	12 56.9	16	1.5	76	6.9	136	12.4
17	13 34.3	13 36.5	12 57.2	17	1.5	77	7.0	137	12.4
18	13 34.5	13 36.7	12 57.4	18	1.6	78	7.1	138	12.5
19	13 34.8	13 37.0	12 57.6	19	1.7	79	7.2	139	12.6
20	13 35.0	13 37.2	12 57.9	20	1.8	80	7.3	140	12.7
21	13 35.3	13 37.5	12 58.1	21	1.9	81	7.4	141	12.8
22	13 35.5	13 37.7	12 58.3	22	2.0	82	7.4	142	12.9
23	13 35.8	13 38.0	12 58.6	23	2.1	83	7.5	143	13.0
24	13 36.0	13 38.2	12 58.8	24	2.2	84	7.6	144	13.1
25	13 36.3	13 38.5	12 59.1	25	2.3	85	7.7	145	13.2
26	13 36.5	13 38.7	12 59.3	26	2.4	86	7.8	146	13.3
27	13 36.8	13 39.0	12 59.5	27	2.5	87	7.9	147	13.4
28	13 37.0	13 39.2	12 59.8	28	2.5	88	8.0	148	13.4
29	13 37.3	13 39.5	13 00.0	29	2.6	89	8.1	149	13.5
30	13 37.5	13 39.7	13 00.3	30	2.7	90	8.2	150	13.6
31	13 37.8	13 40.0	13 00.5	31	2.8	91	8.3	151	13.7
32	13 38.0	13 40.2	13 00.7	32	2.9	92	8.4	152	13.8
33	13 38.3	13 40.5	13 01.0	33	3.0	93	8.4	153	13.9
34	13 38.5	13 40.7	13 01.2	34	3.1	94	8.5	154	14.0
35	13 38.8	13 41.0	13 01.5	35	3.2	95	8.6	155	14.1
36	13 39.0	13 41.2	13 01.7	36	3.3	96	8.7	156	14.2
37	13 39.3	13 41.5	13 01.9	37	3.4	97	8.8	157	14.3
38	13 39.5	13 41.7	13 02.2	38	3.5	98	8.9	158	14.4
39	13 39.8	13 42.0	13 02.4	39	3.5	99	9.0	159	14.4
40	13 40.0	13 42.2	13 02.6	40	3.6	100	9.1	160	14.5
41	13 40.3	13 42.5	13 02.9	41	3.7	101	9.2	161	14.6
42	13 40.5	13 42.7	13 03.1	42	3.8	102	9.3	162	14.7
43	13 40.8	13 43.0	13 03.4	43	3.9	103	9.4	163	14.8
44	13 41.0	13 43.2	13 03.6	44	4.0	104	9.4	164	14.9
45	13 41.3	13 43.5	13 03.8	45	4.1	105	9.5	165	15.0
46	13 41.5	13 43.7	13 04.1	46	4.2	106	9.6	166	15.1
47	13 41.8	13 44.0	13 04.3	47	4.3	107	9.7	167	15.2
48	13 42.0	13 44.3	13 04.6	48	4.4	108	9.8	168	15.3
49	13 42.3	13 44.5	13 04.8	49	4.5	109	9.9	169	15.4
50	13 42.5	13 44.8	13 05.0	50	4.5	110	10.0	170	15.4
51	13 42.8	13 45.0	13 05.3	51	4.6	111	10.1	171	15.5
52	13 43.0	13 45.3	13 05.5	52	4.7	112	10.2	172	15.6
53	13 43.3	13 45.5	13 05.7	53	4.8	113	10.3	173	15.7
54	13 43.5	13 45.8	13 06.0	54	4.9	114	10.4	174	15.8
55	13 43.8	13 46.0	13 06.2	55	5.0	115	10.4	175	15.9
56	13 44.0	13 46.3	13 06.5	56	5.1	116	10.5	176	16.0
57	13 44.3	13 46.5	13 06.7	57	5.2	117	10.6	177	16.1
58	13 44.5	13 46.8	13 06.9	58	5.3	118	10.7	178	16.2
59	13 44.8	13 47.0	13 07.2	59	5.4	119	10.8	179	16.3
60	13 45.0	13 47.3	13 07.4	60	5.5	120	10.9	180	16.4

55m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	13 45.0	13 47.3	13 07.4	0	0.0	60	5.6	120	11.1
1	13 45.3	13 47.5	13 07.7	1	0.1	61	5.6	121	11.2
2	13 45.5	13 47.8	13 07.9	2	0.2	62	5.7	122	11.3
3	13 45.8	13 48.0	13 08.1	3	0.3	63	5.8	123	11.4
4	13 46.0	13 48.3	13 08.4	4	0.4	64	5.9	124	11.5
5	13 46.3	13 48.5	13 08.6	5	0.5	65	6.0	125	11.6
6	13 46.5	13 48.8	13 08.8	6	0.6	66	6.1	126	11.7
7	13 46.8	13 49.0	13 09.1	7	0.6	67	6.2	127	11.7
8	13 47.0	13 49.3	13 09.3	8	0.7	68	6.3	128	11.8
9	13 47.3	13 49.5	13 09.6	9	0.8	69	6.4	129	11.9
10	13 47.5	13 49.8	13 09.8	10	0.9	70	6.5	130	12.0
11	13 47.8	13 50.0	13 10.0	11	1.0	71	6.6	131	12.1
12	13 48.0	13 50.3	13 10.3	12	1.1	72	6.7	132	12.2
13	13 48.3	13 50.5	13 10.5	13	1.2	73	6.8	133	12.3
14	13 48.5	13 50.8	13 10.8	14	1.3	74	6.8	134	12.4
15	13 48.8	13 51.0	13 11.0	15	1.4	75	6.9	135	12.5
16	13 49.0	13 51.3	13 11.2	16	1.5	76	7.0	136	12.6
17	13 49.3	13 51.5	13 11.5	17	1.6	77	7.1	137	12.7
18	13 49.5	13 51.8	13 11.7	18	1.7	78	7.2	138	12.8
19	13 49.8	13 52.0	13 12.0	19	1.8	79	7.3	139	12.9
20	13 50.0	13 52.3	13 12.2	20	1.9	80	7.4	140	13.0
21	13 50.3	13 52.5	13 12.4	21	1.9	81	7.5	141	13.0
22	13 50.5	13 52.8	13 12.7	22	2.0	82	7.6	142	13.1
23	13 50.8	13 53.0	13 12.9	23	2.1	83	7.7	143	13.2
24	13 51.0	13 53.3	13 13.1	24	2.2	84	7.8	144	13.3
25	13 51.3	13 53.5	13 13.4	25	2.3	85	7.9	145	13.4
26	13 51.5	13 53.8	13 13.6	26	2.4	86	8.0	146	13.5
27	13 51.8	13 54.0	13 13.9	27	2.5	87	8.0	147	13.6
28	13 52.0	13 54.3	13 14.1	28	2.6	88	8.1	148	13.7
29	13 52.3	13 54.5	13 14.3	29	2.7	89	8.2	149	13.8
30	13 52.5	13 54.8	13 14.6	30	2.8	90	8.3	150	13.9
31	13 52.8	13 55.0	13 14.8	31	2.9	91	8.4	151	14.0
32	13 53.0	13 55.3	13 15.1	32	3.0	92	8.5	152	14.1
33	13 53.3	13 55.5	13 15.3	33	3.1	93	8.6	153	14.2
34	13 53.5	13 55.8	13 15.5	34	3.1	94	8.7	154	14.2
35	13 53.8	13 56.0	13 15.8	35	3.2	95	8.8	155	14.3
36	13 54.0	13 56.3	13 16.0	36	3.3	96	8.9	156	14.4
37	13 54.3	13 56.5	13 16.2	37	3.4	97	9.0	157	14.5
38	13 54.5	13 56.8	13 16.5	38	3.5	98	9.1	158	14.6
39	13 54.8	13 57.0	13 16.7	39	3.6	99	9.2	159	14.7
40	13 55.0	13 57.3	13 17.0	40	3.7	100	9.3	160	14.8
41	13 55.3	13 57.5	13 17.2	41	3.8	101	9.3	161	14.9
42	13 55.5	13 57.8	13 17.4	42	3.9	102	9.4	162	15.0
43	13 55.8	13 58.0	13 17.7	43	4.0	103	9.5	163	15.1
44	13 56.0	13 58.3	13 17.9	44	4.1	104	9.6	164	15.2
45	13 56.3	13 58.5	13 18.2	45	4.2	105	9.7	165	15.3
46	13 56.5	13 58.8	13 18.4	46	4.3	106	9.8	166	15.4
47	13 56.8	13 59.0	13 18.6	47	4.3	107	9.9	167	15.4
48	13 57.0	13 59.3	13 18.9	48	4.4	108	10.0	168	15.5
49	13 57.3	13 59.5	13 19.1	49	4.5	109	10.1	169	15.6
50	13 57.5	13 59.8	13 19.3	50	4.6	110	10.2	170	15.7
51	13 57.8	14 00.0	13 19.6	51	4.7	111	10.3	171	15.8
52	13 58.0	14 00.3	13 19.8	52	4.8	112	10.4	172	15.9
53	13 58.3	14 00.5	13 20.1	53	4.9	113	10.5	173	16.0
54	13 58.5	14 00.8	13 20.3	54	5.0	114	10.5	174	16.1
55	13 58.8	14 01.0	13 20.5	55	5.1	115	10.6	175	16.2
56	13 59.0	14 01.3	13 20.8	56	5.2	116	10.7	176	16.3
57	13 59.3	14 01.5	13 21.0	57	5.3	117	10.8	177	16.4
58	13 59.5	14 01.8	13 21.3	58	5.4	118	10.9	178	16.5
59	13 59.8	14 02.0	13 21.5	59	5.5	119	11.0	179	16.6
60	14 00.0	14 02.3	13 21.7	60	5.6	120	11.1	180	16.7

56m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	14 00.0	14 02.3	13 21.7	0	0.0	60	5.7	120	11.3
1	14 00.3	14 02.6	13 22.0	1	0.1	61	5.7	121	11.4
2	14 00.5	14 02.8	13 22.2	2	0.2	62	5.8	122	11.5
3	14 00.8	14 03.1	13 22.4	3	0.3	63	5.9	123	11.6
4	14 01.0	14 03.3	13 22.7	4	0.4	64	6.0	124	11.7
5	14 01.3	14 03.6	13 22.9	5	0.5	65	6.1	125	11.8
6	14 01.5	14 03.8	13 23.2	6	0.6	66	6.2	126	11.9
7	14 01.8	14 04.1	13 23.4	7	0.7	67	6.3	127	12.0
8	14 02.0	14 04.3	13 23.6	8	0.8	68	6.4	128	12.1
9	14 02.3	14 04.6	13 23.9	9	0.8	69	6.5	129	12.1
10	14 02.5	14 04.8	13 24.1	10	0.9	70	6.6	130	12.2
11	14 02.8	14 05.1	13 24.4	11	1.0	71	6.7	131	12.3
12	14 03.0	14 05.3	13 24.6	12	1.1	72	6.8	132	12.4
13	14 03.3	14 05.6	13 24.8	13	1.2	73	6.9	133	12.5
14	14 03.5	14 05.8	13 25.1	14	1.3	74	7.0	134	12.6
15	14 03.8	14 06.1	13 25.3	15	1.4	75	7.1	135	12.7
16	14 04.0	14 06.3	13 25.6	16	1.5	76	7.2	136	12.8
17	14 04.3	14 06.6	13 25.8	17	1.6	77	7.3	137	12.9
18	14 04.5	14 06.8	13 26.0	18	1.7	78	7.3	138	13.0
19	14 04.8	14 07.1	13 26.3	19	1.8	79	7.4	139	13.1
20	14 05.0	14 07.3	13 26.5	20	1.9	80	7.5	140	13.2
21	14 05.3	14 07.6	13 26.7	21	2.0	81	7.6	141	13.3
22	14 05.5	14 07.8	13 27.0	22	2.1	82	7.7	142	13.4
23	14 05.8	14 08.1	13 27.2	23	2.2	83	7.8	143	13.5
24	14 06.0	14 08.3	13 27.5	24	2.3	84	7.9	144	13.6
25	14 06.3	14 08.6	13 27.7	25	2.4	85	8.0	145	13.7
26	14 06.5	14 08.8	13 27.9	26	2.4	86	8.1	146	13.7
27	14 06.8	14 09.1	13 28.2	27	2.5	87	8.2	147	13.8
28	14 07.0	14 09.3	13 28.4	28	2.6	88	8.3	148	13.9
29	14 07.3	14 09.6	13 28.7	29	2.7	89	8.4	149	14.0
30	14 07.5	14 09.8	13 28.9	30	2.8	90	8.5	150	14.1
31	14 07.8	14 10.1	13 29.1	31	2.9	91	8.6	151	14.2
32	14 08.0	14 10.3	13 29.4	32	3.0	92	8.7	152	14.3
33	14 08.3	14 10.6	13 29.6	33	3.1	93	8.8	153	14.4
34	14 08.5	14 10.8	13 29.8	34	3.2	94	8.9	154	14.5
35	14 08.8	14 11.1	13 30.1	35	3.3	95	8.9	155	14.6
36	14 09.0	14 11.3	13 30.3	36	3.4	96	9.0	156	14.7
37	14 09.3	14 11.6	13 30.6	37	3.5	97	9.1	157	14.8
38	14 09.5	14 11.8	13 30.8	38	3.6	98	9.2	158	14.9
39	14 09.8	14 12.1	13 31.0	39	3.7	99	9.3	159	15.0
40	14 10.0	14 12.3	13 31.3	40	3.8	100	9.4	160	15.1
41	14 10.3	14 12.6	13 31.5	41	3.9	101	9.5	161	15.2
42	14 10.5	14 12.8	13 31.8	42	4.0	102	9.6	162	15.3
43	14 10.8	14 13.1	13 32.0	43	4.0	103	9.7	163	15.3
44	14 11.0	14 13.3	13 32.2	44	4.1	104	9.8	164	15.4
45	14 11.3	14 13.6	13 32.5	45	4.2	105	9.9	165	15.5
46	14 11.5	14 13.8	13 32.7	46	4.3	106	10.0	166	15.6
47	14 11.8	14 14.1	13 32.9	47	4.4	107	10.1	167	15.7
48	14 12.0	14 14.3	13 33.2	48	4.5	108	10.2	168	15.8
49	14 12.3	14 14.6	13 33.4	49	4.6	109	10.3	169	15.9
50	14 12.5	14 14.8	13 33.7	50	4.7	110	10.4	170	16.0
51	14 12.8	14 15.1	13 33.9	51	4.8	111	10.5	171	16.1
52	14 13.0	14 15.3	13 34.1	52	4.9	112	10.5	172	16.2
53	14 13.3	14 15.6	13 34.4	53	5.0	113	10.6	173	16.3
54	14 13.5	14 15.8	13 34.6	54	5.1	114	10.7	174	16.4
55	14 13.8	14 16.1	13 34.9	55	5.2	115	10.8	175	16.5
56	14 14.0	14 16.3	13 35.1	56	5.3	116	10.9	176	16.6
57	14 14.3	14 16.6	13 35.3	57	5.4	117	11.0	177	16.7
58	14 14.5	14 16.8	13 35.6	58	5.5	118	11.1	178	16.8
59	14 14.8	14 17.1	13 35.8	59	5.6	119	11.2	179	16.9
60	14 15.0	14 17.3	13 36.1	60	5.7	120	11.3	180	17.0

57m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	14 15.0	14 17.3	13 36.1	0	0.0	60	5.8	120	11.5
1	14 15.3	14 17.6	13 36.3	1	0.1	61	5.8	121	11.6
2	14 15.5	14 17.8	13 36.5	2	0.2	62	5.9	122	11.7
3	14 15.8	14 18.1	13 36.8	3	0.3	63	6.0	123	11.8
4	14 16.0	14 18.3	13 37.0	4	0.4	64	6.1	124	11.9
5	14 16.3	14 18.6	13 37.2	5	0.5	65	6.2	125	12.0
6	14 16.5	14 18.8	13 37.5	6	0.6	66	6.3	126	12.1
7	14 16.8	14 19.1	13 37.7	7	0.7	67	6.4	127	12.2
8	14 17.0	14 19.3	13 38.0	8	0.8	68	6.5	128	12.3
9	14 17.3	14 19.6	13 38.2	9	0.9	69	6.6	129	12.4
10	14 17.5	14 19.8	13 38.4	10	1.0	70	6.7	130	12.5
11	14 17.8	14 20.1	13 38.7	11	1.1	71	6.8	131	12.6
12	14 18.0	14 20.3	13 38.9	12	1.2	72	6.9	132	12.7
13	14 18.3	14 20.6	13 39.2	13	1.2	73	7.0	133	12.7
14	14 18.5	14 20.9	13 39.4	14	1.3	74	7.1	134	12.8
15	14 18.8	14 21.1	13 39.6	15	1.4	75	7.2	135	12.9
16	14 19.0	14 21.4	13 39.9	16	1.5	76	7.3	136	13.0
17	14 19.3	14 21.6	13 40.1	17	1.6	77	7.4	137	13.1
18	14 19.5	14 21.9	13 40.3	18	1.7	78	7.5	138	13.2
19	14 19.8	14 22.1	13 40.6	19	1.8	79	7.6	139	13.3
20	14 20.0	14 22.4	13 40.8	20	1.9	80	7.7	140	13.4
21	14 20.3	14 22.6	13 41.1	21	2.0	81	7.8	141	13.5
22	14 20.5	14 22.9	13 41.3	22	2.1	82	7.9	142	13.6
23	14 20.8	14 23.1	13 41.5	23	2.2	83	8.0	143	13.7
24	14 21.0	14 23.4	13 41.8	24	2.3	84	8.1	144	13.8
25	14 21.3	14 23.6	13 42.0	25	2.4	85	8.1	145	13.9
26	14 21.5	14 23.9	13 42.3	26	2.5	86	8.2	146	14.0
27	14 21.8	14 24.1	13 42.5	27	2.6	87	8.3	147	14.1
28	14 22.0	14 24.4	13 42.7	28	2.7	88	8.4	148	14.2
29	14 22.3	14 24.6	13 43.0	29	2.8	89	8.5	149	14.3
30	14 22.5	14 24.9	13 43.2	30	2.9	90	8.6	150	14.4
31	14 22.8	14 25.1	13 43.4	31	3.0	91	8.7	151	14.5
32	14 23.0	14 25.4	13 43.7	32	3.1	92	8.8	152	14.6
33	14 23.3	14 25.6	13 43.9	33	3.2	93	8.9	153	14.7
34	14 23.5	14 25.9	13 44.2	34	3.3	94	9.0	154	14.8
35	14 23.8	14 26.1	13 44.4	35	3.4	95	9.1	155	14.9
36	14 24.0	14 26.4	13 44.6	36	3.5	96	9.2	156	15.0
37	14 24.3	14 26.6	13 44.9	37	3.5	97	9.3	157	15.0
38	14 24.5	14 26.9	13 45.1	38	3.6	98	9.4	158	15.1
39	14 24.8	14 27.1	13 45.4	39	3.7	99	9.5	159	15.2
40	14 25.0	14 27.4	13 45.6	40	3.8	100	9.6	160	15.3
41	14 25.3	14 27.6	13 45.8	41	3.9	101	9.7	161	15.4
42	14 25.5	14 27.9	13 46.1	42	4.0	102	9.8	162	15.5
43	14 25.8	14 28.1	13 46.3	43	4.1	103	9.9	163	15.6
44	14 26.0	14 28.4	13 46.5	44	4.2	104	10.0	164	15.7
45	14 26.3	14 28.6	13 46.8	45	4.3	105	10.1	165	15.8
46	14 26.5	14 28.9	13 47.0	46	4.4	106	10.2	166	15.9
47	14 26.8	14 29.1	13 47.3	47	4.5	107	10.3	167	16.0
48	14 27.0	14 29.4	13 47.5	48	4.6	108	10.4	168	16.1
49	14 27.3	14 29.6	13 47.7	49	4.7	109	10.4	169	16.2
50	14 27.5	14 29.9	13 48.0	50	4.8	110	10.5	170	16.3
51	14 27.8	14 30.1	13 48.2	51	4.9	111	10.6	171	16.4
52	14 28.0	14 30.4	13 48.5	52	5.0	112	10.7	172	16.5
53	14 28.3	14 30.6	13 48.7	53	5.1	113	10.8	173	16.6
54	14 28.5	14 30.9	13 48.9	54	5.2	114	10.9	174	16.7
55	14 28.8	14 31.1	13 49.2	55	5.3	115	11.0	175	16.8
56	14 29.0	14 31.4	13 49.4	56	5.4	116	11.1	176	16.9
57	14 29.3	14 31.6	13 49.7	57	5.5	117	11.2	177	17.0
58	14 29.5	14 31.9	13 49.9	58	5.6	118	11.3	178	17.1
59	14 29.8	14 32.1	13 50.1	59	5.7	119	11.4	179	17.2
60	14 30.0	14 32.4	13 50.4	60	5.8	120	11.5	180	17.3

58m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	14 30.0	14 32.4	13 50.4	0	0.0	60	5.9	120	11.7
1	14 30.3	14 32.6	13 50.6	1	0.1	61	5.9	121	11.8
2	14 30.5	14 32.9	13 50.8	2	0.2	62	6.0	122	11.9
3	14 30.8	14 33.1	13 51.1	3	0.3	63	6.1	123	12.0
4	14 31.0	14 33.4	13 51.3	4	0.4	64	6.2	124	12.1
5	14 31.3	14 33.6	13 51.6	5	0.5	65	6.3	125	12.2
6	14 31.5	14 33.9	13 51.8	6	0.6	66	6.4	126	12.3
7	14 31.8	14 34.1	13 52.0	7	0.7	67	6.5	127	12.4
8	14 32.0	14 34.4	13 52.3	8	0.8	68	6.6	128	12.5
9	14 32.3	14 34.6	13 52.5	9	0.9	69	6.7	129	12.6
10	14 32.5	14 34.9	13 52.8	10	1.0	70	6.8	130	12.7
11	14 32.8	14 35.1	13 53.0	11	1.1	71	6.9	131	12.8
12	14 33.0	14 35.4	13 53.2	12	1.2	72	7.0	132	12.9
13	14 33.3	14 35.6	13 53.5	13	1.3	73	7.1	133	13.0
14	14 33.5	14 35.9	13 53.7	14	1.4	74	7.2	134	13.1
15	14 33.8	14 36.1	13 53.9	15	1.5	75	7.3	135	13.2
16	14 34.0	14 36.4	13 54.2	16	1.6	76	7.4	136	13.3
17	14 34.3	14 36.6	13 54.4	17	1.7	77	7.5	137	13.4
18	14 34.5	14 36.9	13 54.7	18	1.8	78	7.6	138	13.5
19	14 34.8	14 37.1	13 54.9	19	1.9	79	7.7	139	13.6
20	14 35.0	14 37.4	13 55.1	20	2.0	80	7.8	140	13.7
21	14 35.3	14 37.6	13 55.4	21	2.0	81	7.9	141	13.7
22	14 35.5	14 37.9	13 55.6	22	2.1	82	8.0	142	13.8
23	14 35.8	14 38.1	13 55.9	23	2.2	83	8.1	143	13.9
24	14 36.0	14 38.4	13 56.1	24	2.3	84	8.2	144	14.0
25	14 36.3	14 38.6	13 56.3	25	2.4	85	8.3	145	14.1
26	14 36.5	14 38.9	13 56.6	26	2.5	86	8.4	146	14.2
27	14 36.8	14 39.2	13 56.8	27	2.6	87	8.5	147	14.3
28	14 37.0	14 39.4	13 57.0	28	2.7	88	8.6	148	14.4
29	14 37.3	14 39.7	13 57.3	29	2.8	89	8.7	149	14.5
30	14 37.5	14 39.9	13 57.5	30	2.9	90	8.8	150	14.6
31	14 37.8	14 40.2	13 57.8	31	3.0	91	8.9	151	14.7
32	14 38.0	14 40.4	13 58.0	32	3.1	92	9.0	152	14.8
33	14 38.3	14 40.7	13 58.2	33	3.2	93	9.1	153	14.9
34	14 38.5	14 40.9	13 58.5	34	3.3	94	9.2	154	15.0
35	14 38.8	14 41.2	13 58.7	35	3.4	95	9.3	155	15.1
36	14 39.0	14 41.4	13 59.0	36	3.5	96	9.4	156	15.2
37	14 39.3	14 41.7	13 59.2	37	3.6	97	9.5	157	15.3
38	14 39.5	14 41.9	13 59.4	38	3.7	98	9.6	158	15.4
39	14 39.8	14 42.2	13 59.7	39	3.8	99	9.7	159	15.5
40	14 40.0	14 42.4	13 59.9	40	3.9	100	9.8	160	15.6
41	14 40.3	14 42.7	14 00.1	41	4.0	101	9.8	161	15.7
42	14 40.5	14 42.9	14 00.4	42	4.1	102	9.9	162	15.8
43	14 40.8	14 43.2	14 00.6	43	4.2	103	10.0	163	15.9
44	14 41.0	14 43.4	14 00.9	44	4.3	104	10.1	164	16.0
45	14 41.3	14 43.7	14 01.1	45	4.4	105	10.2	165	16.1
46	14 41.5	14 43.9	14 01.3	46	4.5	106	10.3	166	16.2
47	14 41.8	14 44.2	14 01.6	47	4.6	107	10.4	167	16.3
48	14 42.0	14 44.4	14 01.8	48	4.7	108	10.5	168	16.4
49	14 42.3	14 44.7	14 02.1	49	4.8	109	10.6	169	16.5
50	14 42.5	14 44.9	14 02.3	50	4.9	110	10.7	170	16.6
51	14 42.8	14 45.2	14 02.5	51	5.0	111	10.8	171	16.7
52	14 43.0	14 45.4	14 02.8	52	5.1	112	10.9	172	16.8
53	14 43.3	14 45.7	14 03.0	53	5.2	113	11.0	173	16.9
54	14 43.5	14 45.9	14 03.3	54	5.3	114	11.1	174	17.0
55	14 43.8	14 46.2	14 03.5	55	5.4	115	11.2	175	17.1
56	14 44.0	14 46.4	14 03.7	56	5.5	116	11.3	176	17.2
57	14 44.3	14 46.7	14 04.0	57	5.6	117	11.4	177	17.3
58	14 44.5	14 46.9	14 04.2	58	5.7	118	11.5	178	17.4
59	14 44.8	14 47.2	14 04.4	59	5.8	119	11.6	179	17.5
60	14 45.0	14 47.4	14 04.7	60	5.9	120	11.7	180	17.6

59m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	14 45.0	14 47.4	14 04.7	0	0.0	60	6.0	120	11.9
1	14 45.3	14 47.7	14 04.9	1	0.1	61	6.0	121	12.0
2	14 45.5	14 47.9	14 05.2	2	0.2	62	6.1	122	12.1
3	14 45.8	14 48.2	14 05.4	3	0.3	63	6.2	123	12.2
4	14 46.0	14 48.4	14 05.6	4	0.4	64	6.3	124	12.3
5	14 46.3	14 48.7	14 05.9	5	0.5	65	6.4	125	12.4
6	14 46.5	14 48.9	14 06.1	6	0.6	66	6.5	126	12.5
7	14 46.8	14 49.2	14 06.4	7	0.7	67	6.6	127	12.6
8	14 47.0	14 49.4	14 06.6	8	0.8	68	6.7	128	12.7
9	14 47.3	14 49.7	14 06.8	9	0.9	69	6.8	129	12.8
10	14 47.5	14 49.9	14 07.1	10	1.0	70	6.9	130	12.9
11	14 47.8	14 50.2	14 07.3	11	1.1	71	7.0	131	13.0
12	14 48.0	14 50.4	14 07.5	12	1.2	72	7.1	132	13.1
13	14 48.3	14 50.7	14 07.8	13	1.3	73	7.2	133	13.2
14	14 48.5	14 50.9	14 08.0	14	1.4	74	7.3	134	13.3
15	14 48.8	14 51.2	14 08.3	15	1.5	75	7.4	135	13.4
16	14 49.0	14 51.4	14 08.5	16	1.6	76	7.5	136	13.5
17	14 49.3	14 51.7	14 08.7	17	1.7	77	7.6	137	13.6
18	14 49.5	14 51.9	14 09.0	18	1.8	78	7.7	138	13.7
19	14 49.8	14 52.2	14 09.2	19	1.9	79	7.8	139	13.8
20	14 50.0	14 52.4	14 09.5	20	2.0	80	7.9	140	13.9
21	14 50.3	14 52.7	14 09.7	21	2.1	81	8.0	141	14.0
22	14 50.5	14 52.9	14 09.9	22	2.2	82	8.1	142	14.1
23	14 50.8	14 53.2	14 10.2	23	2.3	83	8.2	143	14.2
24	14 51.0	14 53.4	14 10.4	24	2.4	84	8.3	144	14.3
25	14 51.3	14 53.7	14 10.6	25	2.5	85	8.4	145	14.4
26	14 51.5	14 53.9	14 10.9	26	2.6	86	8.5	146	14.5
27	14 51.8	14 54.2	14 11.1	27	2.7	87	8.6	147	14.6
28	14 52.0	14 54.4	14 11.4	28	2.8	88	8.7	148	14.7
29	14 52.3	14 54.7	14 11.6	29	2.9	89	8.8	149	14.8
30	14 52.5	14 54.9	14 11.8	30	3.0	90	8.9	150	14.9
31	14 52.8	14 55.2	14 12.1	31	3.1	91	9.0	151	15.0
32	14 53.0	14 55.4	14 12.3	32	3.2	92	9.1	152	15.1
33	14 53.3	14 55.7	14 12.6	33	3.3	93	9.2	153	15.2
34	14 53.5	14 55.9	14 12.8	34	3.4	94	9.3	154	15.3
35	14 53.8	14 56.2	14 13.0	35	3.5	95	9.4	155	15.4
36	14 54.0	14 56.4	14 13.3	36	3.6	96	9.5	156	15.5
37	14 54.3	14 56.7	14 13.5	37	3.7	97	9.6	157	15.6
38	14 54.5	14 56.9	14 13.8	38	3.8	98	9.7	158	15.7
39	14 54.8	14 57.2	14 14.0	39	3.9	99	9.8	159	15.8
40	14 55.0	14 57.5	14 14.2	40	4.0	100	9.9	160	15.9
41	14 55.3	14 57.7	14 14.5	41	4.1	101	10.0	161	16.0
42	14 55.5	14 58.0	14 14.7	42	4.2	102	10.1	162	16.1
43	14 55.8	14 58.2	14 14.9	43	4.3	103	10.2	163	16.2
44	14 56.0	14 58.5	14 15.2	44	4.4	104	10.3	164	16.3
45	14 56.3	14 58.7	14 15.4	45	4.5	105	10.4	165	16.4
46	14 56.5	14 59.0	14 15.7	46	4.6	106	10.5	166	16.5
47	14 56.8	14 59.2	14 15.9	47	4.7	107	10.6	167	16.6
48	14 57.0	14 59.5	14 16.1	48	4.8	108	10.7	168	16.7
49	14 57.3	14 59.7	14 16.4	49	4.9	109	10.8	169	16.8
50	14 57.5	15 00.0	14 16.6	50	5.0	110	10.9	170	16.9
51	14 57.8	15 00.2	14 16.9	51	5.1	111	11.0	171	17.0
52	14 58.0	15 00.5	14 17.1	52	5.2	112	11.1	172	17.1
53	14 58.3	15 00.7	14 17.3	53	5.3	113	11.2	173	17.2
54	14 58.5	15 01.0	14 17.6	54	5.4	114	11.3	174	17.3
55	14 58.8	15 01.2	14 17.8	55	5.5	115	11.4	175	17.4
56	14 59.0	15 01.5	14 18.0	56	5.6	116	11.5	176	17.5
57	14 59.3	15 01.7	14 18.3	57	5.7	117	11.6	177	17.6
58	14 59.5	15 02.0	14 18.5	58	5.8	118	11.7	178	17.7
59	14 59.8	15 02.2	14 18.8	59	5.9	119	11.8	179	17.8
60	15 00.0	15 02.5	14 19.0	60	6.0	120	11.9	180	17.9

NAVIGATIONAL STAR CHART

The star chart assists the navigator in identifying stars. The stars of each constellation are connected by dotted lines; the 57 stars given on the daily pages are identified by their names and numbers, the 34 stars used in H. O. 249 having their names and numbers underlined, and the other navigational stars are identified by their Greek letters. The sidereal hour angle and declination of each star can be determined from the map by means of the network of vertical and horizontal lines. The SHA's are measured (0° to 360°) from the vertical line passing through the Vernal Equinox at 0°. The declinations are measured north and south (+90° to −90°) from the celestial equator which is represented by a horizontal line through the center.

The rectangular shape of the chart distorts the relative positions of the stars in the polar regions. For example the north polar region is distorted so that the pointer stars of the big dipper are not in alignment with Polaris. A globe would give a better representation, and an observer from the inside would see the constellations as they appear in the sky. Then the SHA lines would converge at the north and south poles and the equator and ecliptic would be circles.

An observer's local meridian at any given instant may be located on the chart by means of the SHA coordinates. The basic relation GHA*=GHA ♈+SHA* may be written:

SHA*=GHA*−GHA ♈

For a star on the meridian the GHA* is equal to the west longitude, whence

SHA (local meridian)=W Long.−GHA ♈

East longitude may be converted into west longitude by subtracting from 360°.

Example: Locate on the chart the local meridian of an observer in longitude 110° W on Jan. 1, at 6^h GMT. From the daily page for Jan. 1, 2, 3, at 6^h, Jan. 1 the GHA ♈=190°. The SHA of his meridian will therefore be 110°+360°−190°=280°.

The identification of a star directly overhead, i. e., in the zenith, is easily made since the point overhead is on the local meridian and also has a Dec. equal to the observer's latitude.

Example: Assume that the observer in the above example is in latitude 40° N and that a star in the zenith is to be identified. The SHA of the star is exactly equal to the SHA of the local meridian and was found to be 280°. The star's Dec. is +40° since the observer's latitude is equal to the Dec. of a point in the zenith.

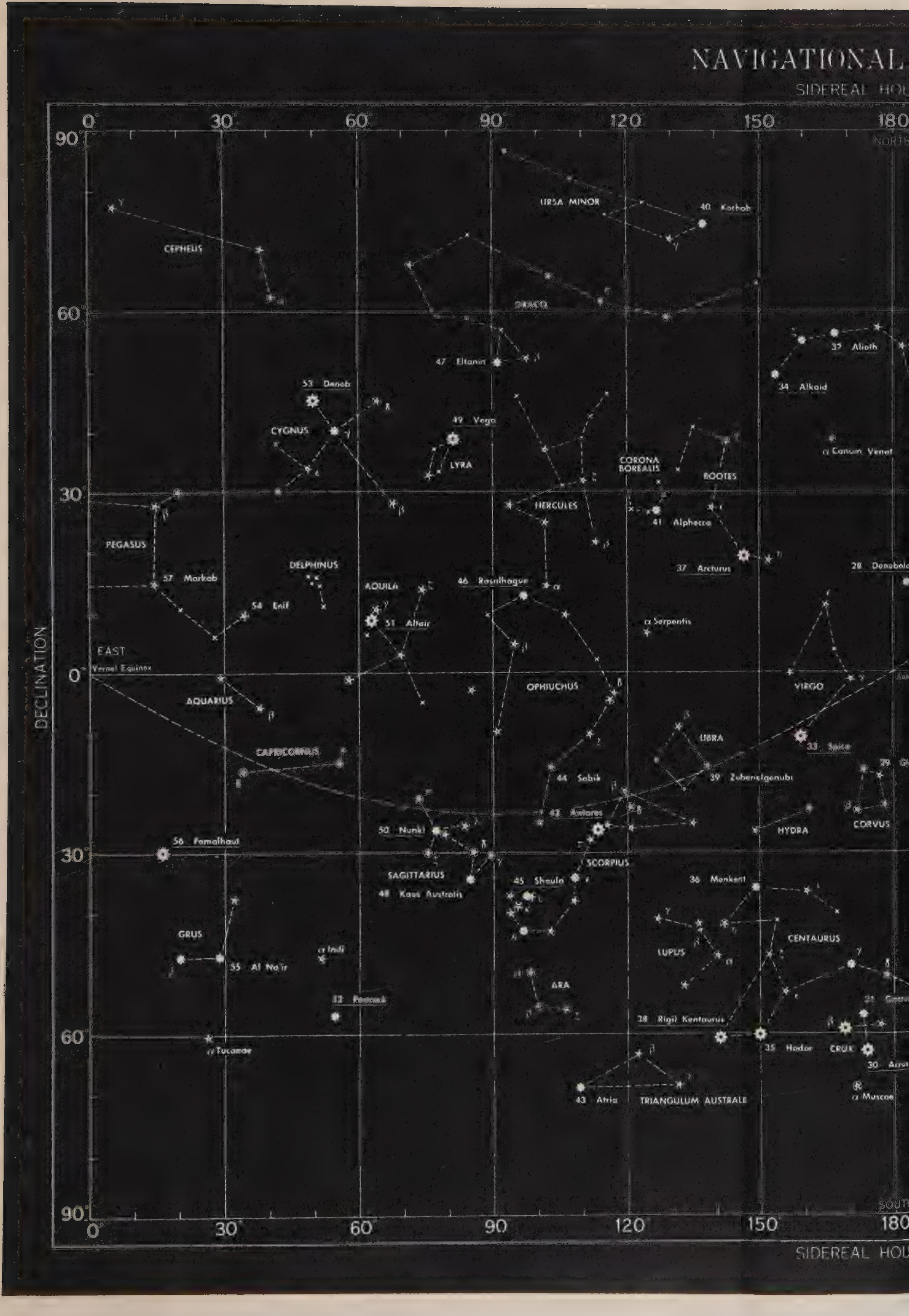
Examination of the chart in the region of SHA=280° and Dec.=+40° shows the brightest star in the region to be the first magnitude star Capella. To verify, this region of the chart may be compared in detail with the sky. One finds the conspicuous triangle formed by the three first magnitude stars Pollux, Aldebaran, and Capella.

A star to the north or south of the zenith is easily identified because its angular distance from the zenith is equal to the difference between its declination and the observer's latitude. Thus, in the above example, Rigel (Dec.−10°) would appear about 50° south of the zenith or at an altitude of 40°.

The chart may also be used with the "Star Identification Table" in H. O. 214. The table is used to convert an observed altitude and azimuth into Dec. and LHA; the LHA is converted into SHA, and the problem becomes that of the above example, i. e., identification from SHA and Dec. The SHA may be found by adding the LHA, if west, to the SHA of the local meridian and by subtracting it if east.

The ecliptic, which is the path of the Sun among the stars, is represented on the chart by a curved dotted line. The Moon and planets remain always within a few degrees of the ecliptic.

The SHA of a planet can be found by inspection from the daily page. First find the time when the GHA ♈=0°, then the GHA of any object at the corresponding time is also the SHA of that object.



NAVIGATIONAL
SIDEREAL HOU
DECLINATION
EAST
Vernal Equinox
CEPHEUS
URSA MINOR
40 Kochab
DRACO
47 Eltanin
53 Deneb
CYGNUS
49 Vega
LYRA
32 Alioth
34 Alkaid
α Canum Venat
CORONA BOREALIS
BOOTES
HERCULES
41 Alphecca
PEGASUS
DELPHINUS
57 Markab
54 Enif
AQUILA
51 Altair
46 Rasalhague
37 Arcturus
28 Denebola
α Serpentis
OPHIUCHUS
VIRGO
AQUARIUS
CAPRICORNUS
LIBRA
33 Spica
44 Sabik
39 Zubenelgenubi
42 Antares
50 Nunki
HYDRA
CORVUS
56 Fomalhaut
SCORPIUS
SAGITTARIUS
48 Kaus Australis
45 Shaula
36 Menkent
GRUS
55 Al Na'ir
α Indi
LUPUS
CENTAURUS
ARA
52 Peacock
38 Rigil Kentaurus
35 Hadar
CRUX
30 Acru
α Tucanae
43 Atria
TRIANGULUM AUSTRALE
α Muscae
NORTH
SOUTH
0° 30° 60° 90° 120° 150° 180
90° 60° 30° 0° 30° 60° 90°
SIDEREAL HOU

STAR CHART

ANGLE
210
240
270
300
330
360
90
60
30
0
DECLINATION
Polaris
CASSIOPEIA
3 Schedar
27 Dubhe
URSA MAJOR
LYNX
12 Capella
AURIGA
9 Mirfak
PERSEUS
ANDROMEDA
TRIANGULUM
14 Elnath
21 Pollux
GEMINI
TAURUS
1 Alpheratz
6 Hamal
ARIES
LEO
10 Aldebaran
26 Regulus
CANIS MINOR
16 Betelgeuse
13 Bellatrix
20 Procyon
ORION
8 Menkar
WEST
HYDRA
15 Alnilam
CETUS
25 Alphard
11 Rigel
18 Sirius
CANIS MAJOR
LEPUS
4 Diphda
19 Adhara
ERIDANUS
PUPPIS
COLUMBA
23 Suhail
7 Acamar
VELA
DORADO
17 Canopus
5 Achernar
22 Avior
CARINA
24 Miaplacidus
HYDRUS
210
240
270
300
330
360
ANGLE
Scale of magnitudes: 1st 2nd 3rd 4th 5th

Date Due

SEP 2. 1954			

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CORRECTION TO OBSERVED ALTITUDE OF MOON

ADD

Obs. Alt. °	0′–8′	8′–15′	15′–23′	23′–30′	30′–38′	38′–45′	45′–53′	53′–60′
1	32.6	33.6	34.5	35.3	36.1	36.9	37.6	38.2
2	38.8	39.4	40.0	40.5	41.0	41.4	41.9	42.3
3	42.7	43.1	43.4	43.8	44.1	44.4	44.7	45.0
4	45.2	45.5	45.8	46.0	46.2	46.4	46.6	46.8
5	47.0	47.2	47.4	47.6	47.7	47.9	48.0	48.2
6	48.3	48.4	48.6	48.7	48.8	48.9	49.0	49.1
7	49.2	49.3	49.4	49.5	49.6	49.7	49.8	49.9
8	49.9	50.0	50.1	50.2	50.3	50.3	50.4	50.4
9	50.5	50.5	50.6	50.6	50.7	50.7	50.8	50.8
10	50.9	50.9	50.9	51.0	51.0	51.0	51.1	51.1
11	51.1	51.2	51.2	51.2	51.2	51.3	51.3	51.3
12	51.3	51.3	51.4	51.4	51.4	51.4	51.4	51.4
13	51.4	51.5	51.5	51.5	51.5	51.5	51.5	51.5
14	51.5	51.5	51.5	51.5	51.5	51.5	51.5	51.5
15	51.5	51.5	51.5	51.5	51.5	51.5	51.5	51.5
16	51.5	51.5	51.4	51.4	51.4	51.4	51.4	51.4
17	51.4	51.4	51.4	51.3	51.3	51.3	51.3	51.3
18	51.3	51.2	51.2	51.2	51.2	51.2	51.1	51.1
19	51.1	51.1	51.1	51.0	51.0	51.0	51.0	50.9
20	50.9	50.9	50.9	50.8	50.8	50.8	50.8	50.7
21	50.7	50.7	50.6	50.6	50.6	50.6	50.5	50.5
22	50.5	50.4	50.4	50.4	50.3	50.3	50.3	50.2
23	50.2	50.2	50.1	50.1	50.0	50.0	50.0	49.9
24	49.9	49.9	49.8	49.8	49.7	49.7	49.7	49.6
25	49.6	49.5	49.5	49.5	49.4	49.4	49.3	49.3
26	49.2	49.2	49.2	49.1	49.1	49.0	49.0	48.9
27	48.9	48.8	48.8	48.7	48.7	48.6	48.6	48.5
28	48.5	48.4	48.4	48.3	48.3	48.2	48.2	48.1
29	48.1	48.0	48.0	47.9	47.9	47.8	47.8	47.7
30	47.7	47.6	47.6	47.5	47.5	47.4	47.3	47.3
31	47.2	47.2	47.1	47.1	47.0	46.9	46.9	46.8
32	46.8	46.7	46.7	46.6	46.5	46.5	46.4	46.4
33	46.3	46.2	46.2	46.1	46.0	46.0	45.9	45.9
34	45.8	45.7	45.7	45.6	45.5	45.5	45.4	45.4
35	45.3	45.2	45.2	45.1	45.0	45.0	44.9	44.8
36	44.8	44.7	44.6	44.6	44.5	44.4	44.3	44.3
37	44.2	44.1	44.1	44.0	43.9	43.9	43.8	43.7
38	43.7	43.6	43.5	43.4	43.4	43.3	43.2	43.1
39	43.1	43.0	42.9	42.9	42.8	42.7	42.6	42.6
40	42.5	42.4	42.3	42.3	42.2	42.1	42.0	42.0
41	41.9	41.8	41.7	41.6	41.6	41.5	41.4	41.4
42	41.3	41.2	41.1	41.0	40.9	40.9	40.8	40.7
43	40.6	40.5	40.5	40.4	40.3	40.2	40.1	40.0
44	40.0	39.9	39.8	39.7	39.6	39.6	39.5	39.4
45	39.3	39.2	39.1	39.0	39.0	38.9	38.8	38.7

Obs. Alt. °	0′–8′	8′–15′	15′–23′	23′–30′	30′–38′	38′–45′	45′–53′	53′–60′
46	38.6	38.5	38.5	38.4	38.3	38.2	38.1	38.0
47	37.9	37.8	37.8	37.7	37.6	37.5	37.4	37.3
48	37.2	37.1	37.1	37.0	36.9	36.8	36.7	36.6
49	36.5	36.4	36.3	36.2	36.2	36.1	36.0	35.9
50	35.8	35.7	35.6	35.5	35.4	35.3	35.2	35.1
51	35.0	35.0	34.9	34.8	34.7	34.6	34.5	34.4
52	34.3	34.2	34.1	34.0	33.9	33.8	33.7	33.6
53	33.5	33.4	33.3	33.2	33.1	33.0	33.0	32.9
54	32.8	32.7	32.6	32.5	32.4	32.3	32.2	32.1
55	32.0	31.9	31.8	31.7	31.6	31.5	31.4	31.3
56	31.2	31.1	31.0	30.9	30.8	30.7	30.6	30.5
57	30.4	30.3	30.2	30.1	30.0	29.9	29.8	29.7
58	29.6	29.4	29.3	29.2	29.1	29.0	28.9	28.8
59	28.7	28.6	28.5	28.4	28.3	28.2	28.1	28.0
60	27.9	27.8	27.7	27.6	27.5	27.4	27.3	27.2
61	27.0	26.9	26.8	26.7	26.6	26.5	26.4	26.3
62	26.2	26.1	26.0	25.9	25.8	25.7	25.5	25.4
63	25.3	25.2	25.1	25.0	24.9	24.8	24.7	24.6
64	24.5	24.4	24.2	24.1	24.0	23.9	23.8	23.7
65	23.6	23.5	23.4	23.3	23.1	23.0	22.9	22.8
66	22.7	22.6	22.5	22.4	22.3	22.1	22.0	21.9
67	21.8	21.7	21.6	21.5	21.4	21.2	21.1	21.0
68	20.9	20.8	20.7	20.6	20.5	20.3	20.2	20.1
69	20.0	19.9	19.8	19.7	19.5	19.4	19.3	19.2
70	19.1	19.0	18.9	18.7	18.6	18.5	18.4	18.3
71	18.2	18.1	17.9	17.8	17.7	17.6	17.5	17.4
72	17.2	17.1	17.0	16.9	16.8	16.7	16.5	16.4
73	16.3	16.2	16.1	16.0	15.8	15.7	15.6	15.5
74	15.4	15.3	15.1	15.0	14.9	14.8	14.7	14.6
75	14.4	14.3	14.2	14.1	14.0	13.8	13.7	13.6
76	13.5	13.4	13.3	13.1	13.0	12.9	12.8	12.7
77	12.5	12.4	12.3	12.2	12.1	11.9	11.8	11.7
78	11.6	11.5	11.3	11.2	11.1	11.0	10.9	10.7
79	10.6	10.5	10.4	10.3	10.1	10.0	9.9	9.8
80	9.7	9.5	9.4	9.3	9.2	9.1	8.9	8.8
81	8.7	8.6	8.5	8.3	8.2	8.1	8.0	7.9
82	7.7	7.6	7.5	7.4	7.2	7.1	7.0	6.9
83	6.8	6.6	6.5	6.4	6.3	6.2	6.0	5.9
84	5.8	5.7	5.5	5.4	5.3	5.2	5.1	4.9
85	4.8	4.7	4.6	4.5	4.3	4.2	4.1	4.0
86	3.8	3.7	3.6	3.5	3.4	3.2	3.1	3.0
87	2.9	2.7	2.6	2.5	2.4	2.3	2.1	2.0
88	1.9	1.8	1.6	1.5	1.4	1.3	1.2	1.0
89	0.9	0.8	0.7	0.5	0.4	0.3	0.2	0.1

Add to the observed altitude of the Moon's upper limb, lower limb, or center; and apply also the additional correction from the daily page. The degrees of observed altitude are in the column, and the minutes across the top. If the minutes of observed altitude are between 0′.0 and 8′.0, use the first column of corrections; if between 8′.0 and 15′.0, use the second column; etc. If the minutes are exactly 0′.0, 8′.0, 15′.0, etc., use the right-hand column of the two possible.

For height of eye, and corrections for Sun, planets, and stars, see front cover.

STARS

Numerical Order					Order of SHA			
No.	Name	Mag.	SHA	Dec.	SHA	Dec.	No.	Name
			°	°	°	°		
1	Alpheratz	2.2	359	+29	14	+15	57	Markab
2	Ankaa	2.4	354	−42	16	−30	56	Fomalhaut
3	Schedar	2.5	351	+56	29	−47	55	Al Na'ir
4	Diphda	2.2	350	−18	35	+10	54	Enif
5	Achernar	0.6	336	−57	50	+45	53	Deneb
6	Hamal	2.2	329	+23	54	−57	52	Peacock
7	Acamar	3.1	316	−40	63	+ 9	51	Altair
8	Menkar	2.8	315	+ 4	77	−26	50	Nunki
9	Mirfak	1.9	310	+50	81	+39	49	Vega
10	Aldebaran	1.1	292	+16	85	−34	48	Kaus Aust.
11	Rigel	0.3	282	− 8	91	+51	47	Eltanin
12	Capella	0.2	282	+46	97	+13	46	Rasalhague
13	Bellatrix	1.7	279	+ 6	97	−37	45	Shaula
14	Elnath	1.8	279	+29	103	−16	44	Sabik
15	Alnilam	1.8	277	− 1	109	−69	43	Atria
16	Betelgeuse	0.1 to 1.2	272	+ 7	113	−26	42	Antares
17	Canopus	−0.9	264	−53	127	+27	41	Alphecca
18	Sirius	−1.6	259	−17	137	+74	40	Kochab
19	Adhara	1.6	256	−29	138	−16	39	Zubenelgenubi
20	Procyon	0.5	246	+ 5	141	−61	38	Rigil Kent.
21	Pollux	1.2	244	+28	147	+19	37	Arcturus
22	Avior	1.7	235	−59	149	−36	36	Menkent
23	Suhail	2.2	223	−43	150	−60	35	Hadar
24	Miaplacidus	1.8	222	−70	154	+50	34	Alkaid
25	Alphard	2.2	219	− 8	159	−11	33	Spica.
26	Regulus	1.3	209	+12	167	+56	32	Alioth
27	Dubhe	2.0	195	+62	173	−57	31	Gacrux
28	Denebola	2.2	183	+15	174	−63	30	Acrux
29	Gienah	2.8	177	−17	177	−17	29	Gienah
30	Acrux	1.1	174	−63	183	+15	28	Denebola
31	Gacrux	1.6	173	−57	195	+62	27	Dubhe
32	Alioth	1.7	167	+56	209	+12	26	Regulus
33	Spica	1.2	159	−11	219	− 8	25	Alphard
34	Alkaid	1.9	154	+50	222	−70	24	Miaplacidus
35	Hadar	0.9	150	−60	223	−43	23	Suhail
36	Menkent	2.3	149	−36	235	−59	22	Avior
37	Arcturus	0.2	147	+19	244	+28	21	Pollux
38	Rigil Kentaurus	0.1	141	−61	246	+ 5	20	Procyon
39	Zubenelgenubi	2.9	138	−16	256	−29	19	Adhara
40	Kochab	2.2	137	+74	259	−17	18	Sirius
41	Alphecca	2.3	127	+27	264	−53	17	Canopus
42	Antares	1.2	113	−26	272	+ 7	16	Betelgeuse
43	Atria	1.9	109	−69	277	− 1	15	Alnilam
44	Sabik	2.6	103	−16	279	+29	14	Elnath
45	Shaula	1.7	97	−37	279	+ 6	13	Bellatrix
46	Rasalhague	2.1	97	+13	282	+46	12	Capella
47	Eltanin	2.4	91	+51	282	− 8	11	Rigel
48	Kaus Australis	2.0	85	−34	292	+16	10	Aldebaran
49	Vega	0.1	81	+39	310	+50	9	Mirfak
50	Nunki	2.1	77	−26	315	+ 4	8	Menkar
51	Altair	0.9	63	+ 9	316	−40	7	Acamar
52	Peacock	2.1	54	−57	329	+23	6	Hamal
53	Deneb	1.3	50	+45	336	−57	5	Achernar
54	Enif	2.5	35	+10	350	−18	4	Diphda
55	Al Na'ir	2.2	29	−47	351	+56	3	Schedar
56	Fomalhaut	1.3	16	−30	354	−42	2	Ankaa
57	Markab	2.6	14	+15	359	+29	1	Alpheratz